THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

Volume 17 MAY, 1938 Number 5

MARY LOUISE McLAUGHLIN

For story, see page 217

ESTABLISHED 1869

B. F. DRAKENFELD & CO.

INCORPORATED

VITRIFIABLE COLORS

Special and Unique Color Shades Prepared to Meet Individual Requirements

OXIDE COLORS—*For WET and DRY PROCESS Porcelain Enamels*

BODY—SLIP—GLAZE STAINS
UNDERGLAZE—OVERGLAZE COLORS } *For all Types of Pottery—Tile and Heavy Clay Products*

GLASS COLORS—FLUXES—ENAMELS—*For all Types of Glass Decoration*

GOLD . . . SILVER . . . PLATINUM . . . LUSTRE PREPARATIONS

Printing Tissues—Etching Supplies—Oils—Mediums—Banding Wheels—
Brushes—Palette Knives—Perfection Portable Decorating Kilns

**Specialists
In Vitrifiable Colors
Since 1869**

METALLIC OXIDES . . . CHEMICALS

Alumina
Antimony
Arsenic
Barium Carbonate
Bone Ash
Boracic Acid
Borax
Cadmium Carbonate
Cadmium Oxide
Cadmium Sulphide
Cerium Hydrate
Chrome Oxide Green
Clay Vallender
Cobalt Oxide Black
Cobalt Sulphate
Copper Carbonate
Copper Oxides
Drakolene
Drakosett
Epsom Salts
Glass Decolorizers
Iron Chromate
Iron Oxides
Iron Sulphide
Jack Frost
Frosting Compounds
Japanese Ochre Calcined
Lead Chromates
Lepidolite
Manganese Carbonate
Manganese Chloride
Magnesium Carbonate
Manganese Dioxide
Neodymium Oxalate
Nickel Carbonate
Nickel Oxides
Nickel Sulphate
Ochres
Polishing Rouges
Potassium Carbonate
Potassium Chromate
Potassium Bichromate
Powder Blue
Rutile Powdered
Selenium
Sodium Bichromate
Sodium Selenite
Sodium Silico Fluoride
Tin Oxide
Titanium Oxide
Umbers
Uranium Oxide Orange
Uranium Oxide Yellow
Uranium Nitrate
Zinc Oxides
Zirconium Oxide
Whiting

45-7 Park Place, New York

BRANCHES: East Liverpool, Ohio : : Chicago, Illinois : : Works - Washington, Pa.
PACIFIC COAST AGENTS: Braun Corp., Los Angeles : : Braun-Knecht-Heimann Co., San Francisco

THE BULLETIN OF THE AMERICAN CERAMIC SOCIETY

Volume 17 May, 1938 Number 5

CONTENTS

Papers

Should the Downdraft Periodic Kiln Be Round or Rectangular?—W. D. Richardson 197
Stoker-Fired Round Downdraft Kilns—J. H. Isenhour 201
Evaporating the Water with Burning Alcohol as a Rapid Means of Determining Moisture Content of Soils and of Molding Sands—G. J. Bouyoucos 203
Drying Characteristics of a Calcareous Surface Clay—R. K. Hursh and C. R. Filippi 206
Further Study of Water Penetrability of Clay and Shale Building Brick—J. W. McBurney and A. R. Eberle 210

Communications—Ceramic History

Mary Louise McLaughlin 217
Honorary Membership to Miss McLaughlin 225

Activities of the Society

Annual Report on Glass—Alexander Silverman 226
Alumina-Silica Relationship in Glass—Alexander Silverman 226
Letter to Editor: Organic Electrolytes for Pottery Use 227
President's Page: Franklin Institute—V. V. Kelsey 227
Honorary Members, 1938: Frederick Carder by M. E. Holmes 228
Lucien Delloye by Alexander Silverman 228
Annual Reports of Standing Committees
Committee on Patents 229
No Patent Legislation This Session 236
Committee on Dust Hazards 236
Report of Structural Clay Products Research Foundation—Committee on Geological Surveys—Joint Committee on Illuminating Glasses 237
Report of Enamel Division Research Committee—Suggestions to Comm. D-3, A.S.T.M., Concerning Impurities in Gaseous Fuels—Secretary's Message 238
Report of Committee on New York World's Fair—Committee on Divisions and Sections 239
Secretary's Message: Why Registration Fees at Meetings 240
Membership Record to April 18, 1938 241
Report on General Membership—New Members—Roster Changes 242
Necrology: J. G. Barbour 243
Canadian Ceramic Society Greetings 243
Local Sections: Northern California—Pittsburgh 243
Central Ohio—Pittsburgh—St. Louis 244
Members of Standing Committees, 1938–1939 244
Appointed Representatives, 1938–1939 245
Student Branch News: University of Illinois, *Illini Ceramist* for 1938—Ohio State University—Rutgers University—Pennsylvania State College 246
Division Personnel Chart, 1938–1939 247
School Notes: University of Illinois, Fifth Conference on Glass Problems 248
West Virginia University Summer Courses in Pottery 248
Massachusetts Institute of Technology Summer Course in "Theoretical and Applied Colloid Chemistry and Colloid Physics" 248

Notes and News

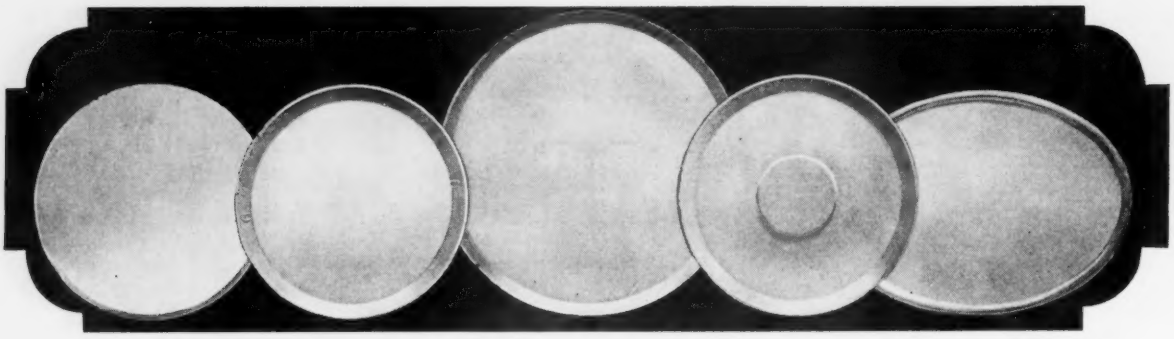
Honorary Degree for J. E. Frazier 249
Dr. Gillett, 1939 Howe Memorial Lecturer 249
Lalor Foundation Fellowship Awards 249
H. R. Howell Exhibited at Toledo Museum of Art 249
International Chemistry Congress Delegates 250
Industrial Research Laboratories, Bulletin 91 Revised 250
Porcelain Enamel Institute Meetings 250
Eastern Enameler's Club 250
Simplified Practice Recommendation R61-30, Clay Tile for Floors and Walls 250

Advertisers' Index 6

Buyers' Guide 9

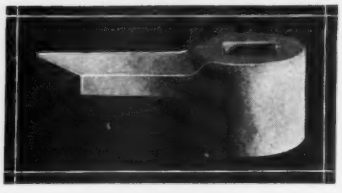
Publication Office: 20th & Northampton Sts., Easton, Pa.
Editorial and Advertising Office: 2525 N. High St., Columbus, Ohio.
Executive Office: 2525 N. High St., Columbus, Ohio.
Committee on Publications: J. D. Sullivan, *Chairman;* R. F. Sherwood, E. de F. Curtis, W. W. Winship, Ross C. Purdy.

Entered as second-class matter at the post office at Easton, Pa., under the act of March 3, 1879. Published monthly.
Subscription $1.50 a year. Single numbers twenty-five cents.
(Foreign and Canadian postage, 50¢ additional on subscriptions)
(Copyright 1938, American Ceramic Society, Inc.)



High Fire Setters

Dinnerware manufacturers are enthusiastic in their praise of the LOUTHAN *Hi-Fire* Setter . . . not only because it permits increased kiln production, but because it assures more "firsts." The LOUTHAN Setter is made of a *hard fire* refractory body resistant to thermal shock. Precision formed it retains true alignment through countless "fires" without warping . . . sagging or dunting. It provides a clean, smooth placing surface. It is rugged in structure and will withstand abnormal kiln-room abuse indefinitely.



THIMBLES

Hi-Fire Thimbles are precision made in steel dies. Hard, uniform and have high insulating value. Resistant to thermal shock. Full range of standard and special sizes.

LOUTHAN Setters are being quite commonly employed in the green room to overcome warping due to faulty boards. They find similar utility in preventing losses caused by warped tunnel-kiln bats. One manufacturer reports adding 40 dozen 7" plates per car by using LOUTHAN Setters . . . *with no change in head room.* Also checked many times the life of best previous make . . . and are still in regular service. Thus, real economy is assured plus truer ware and more of it.

Made in all sizes. Prices upon request.

TILE MANUFACTURERS may have samples of *KIROX* Setter Pins in any size or length. Straight and true . . . will not warp. For "rearing" or "racking" . . . one fire or two. Specify size and length desired.

DINNERWARE SETTERS
TILE SETTER PINS
DECORATING THIMBLES
FIRING RACKS
PINS, STILTS, SPURS, PROPS, *etc.*

LOUTHAN
REFRACTORIES

The LOUTHAN MANUFACTURING COMPANY
Ceramic Specialists
EAST LIVERPOOL, OHIO, U. S. A.

Lancaster

"THE SCIENTIFIC COUNTER-CURRENT RAPID BATCH MIXER"

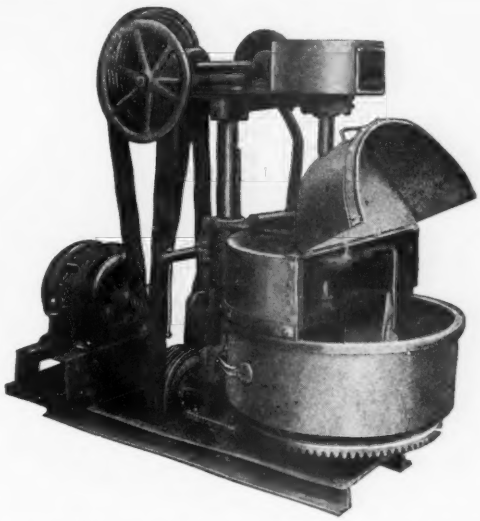
will mix all types of

ABRASIVE BATCHES

with remarkable

SPEED and EFFICIENCY

and in addition, offers the following advantages, to name only a few . . .



The SKG "LANCASTER" Mixer with dust cover open, ready to receive batch

1. A perfect blending of all ingredients whether mixed with pulverized clays and water, sodium silicate of varying viscosity, cold rubber and powdered fillers, or bakelite . . . and a consequent uniform coating of *all* particles with the binder, leaving no rich or lean spots in the batch.
2. The thorough, scientific mixing action is at the same time gentle enough to insure preservation of grain sizes . . . . . this is of inestimable value to the Abrasive Industry.
3. Because the action is so gentle the wear on the mixing tool equipment (and the danger of contamination) is reduced to a negligible minimum.
4. Savings in Binder or Solvent are possible . . . . savings in Mixing Time and Mixing Labor are positive.
5. Complete dust control is provided by the fully enclosed mixing unit.

These are just a few of the reasons that "LANCASTER" Mixers have become so popular in the Abrasives Industry. Why not write today for Bulletin 70 B and learn how you can improve your products and at the same time save real money with a "LANCASTER." No obligation, of course.

LANCASTER IRON WORKS, INC.
BRICK MACHINERY DIVISION
LANCASTER, PENNA., U. S. A.

Lancaster

"THE SCIENTIFIC COUNTER-CURRENT RAPID BATCH MIXER"

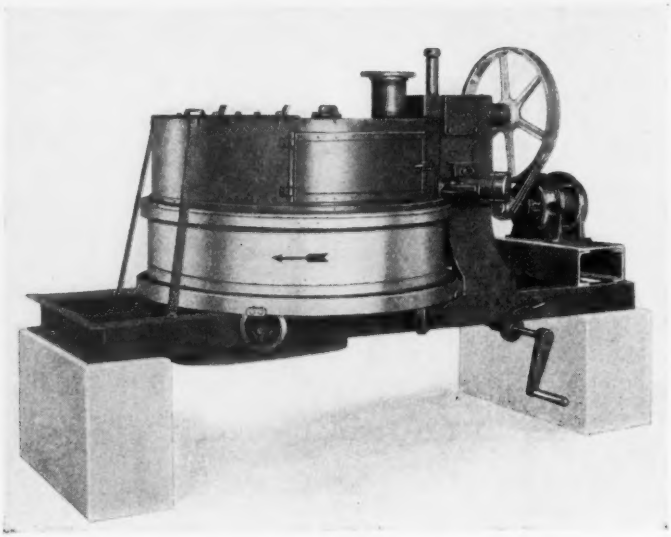
brings to the

GLASS and VITREOUS ENAMEL INDUSTRIES

unheard of

SPEED and ECONOMIES

because.....



Illustrating the fully enclosed No. 4 "LANCASTER" Mixer. Symbol E B G-4

1. The thorough, scientific preparation of the batch makes possible increased output from either tanks or pots without danger of causing "stones."
2. Closed type units retain *all* valuable ingredients in the mixing chamber and provide complete dust control for the reduction of occupational hazard.
3. Possible reduction of colorizer for any required depth of color . . . . . positive reduction of Mixing Time and Mixing Labor.
4. The mixing action is so gentle that no mechanical heat is generated in the batch nor is there any crystallization of sensitive components.
5. Crushed cullet can be introduced in the mixer without the necessity for pre-grinding.

"LANCASTER" Mixers are daily gaining in popularity for the production of Glass and Vitreous Enamel Batches. Write for a copy of Bulletin 70 B and you will learn what a "LANCASTER" can do for you.

LANCASTER IRON WORKS, INC.
BRICK MACHINERY DIVISION
LANCASTER, PENNA., U. S. A.

Lancaster

"THE SCIENTIFIC COUNTER-CURRENT RAPID BATCH MIXER"

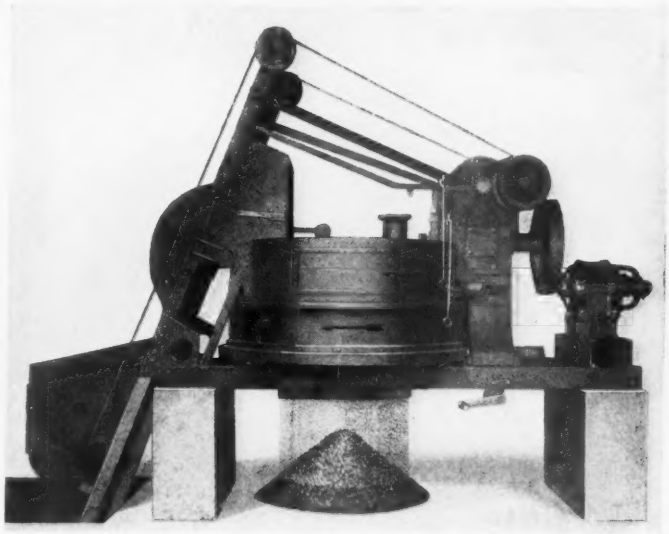
is winning new friends every day in the

CERAMIC and REFRACTORY INDUSTRIES

because the "LANCASTER" System popularized

DRY MIXING

Dry Mixing is a process whereby pre-sized materials are first uniformly blended in the dry state after which the correct proportion of water is added and distributed throughout the batch. A few of the advantages of Dry Mixing are .....



Illustrating the fully enclosed standard No. 4 "LANCASTER" Mixer, with full batch elevator hopper. Symbol E A G-4

1. The finished product is straighter and stronger. One prominent manufacturer reports an improved dry strength of 30% and an improved fired strength of 30%.*

2. Labor costs are reduced as much as 30%.

3. Power costs are reduced up to 50%. One manufacturer reports reduction in power required from 86 HP to 17.8 HP.*

4. Operation and maintenance costs are reduced substantially. It actually costs no more to operate a "LANCASTER" than filter sacks would cost in the wet process. The wear (and consequently the contamination from iron oxides) is reduced to a negligible minimum.

5. Because of the accuracy with which the moisture is controlled the "LANCASTER" assures uniform workability, straighter, more uniform ware, closer dimensional tolerances and greatly reduced losses.

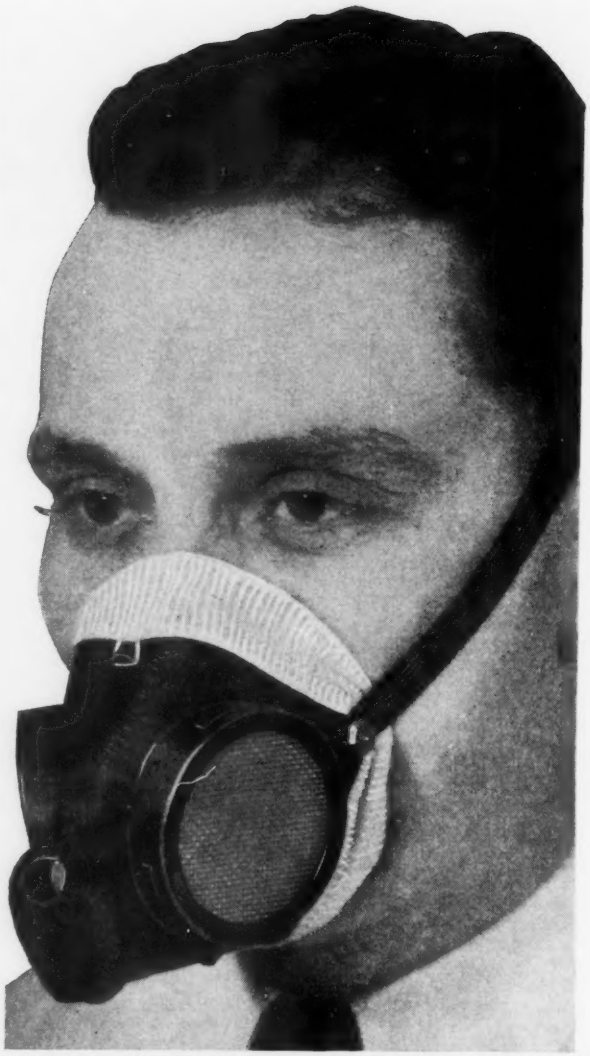
Other Ceramic Manufacturers are investigating and discovering the advantages of Dry Mixing with the "LANCASTER" System ..... why don't you? Write today for your free copy of Bulletin 70 B ..... it tells the whole story.

* Names on request

LANCASTER IRON WORKS, INC.
BRICK MACHINERY DIVISION
LANCASTER, PENNA., U. S. A.

ALPHABETICAL LIST OF ADVERTISERS

	Page
Allied Engineering Company	23
American Potash & Chemical Corporation	21
American Telephone & Telegraph Co.	26
Bethlehem Steel Company	20
Buyers' Guide	9–12
Celo Mines, Inc.	216
Ceramic Color & Chemical Mfg. Company	16
Chicago Vitreous Enamel Product Company	23
Classified Ads	25
Corhart Refractories Company	14
Cover, H. S.	6
Denver Fire Clay Co.	25
Drakenfeld, B. F., & Co.	Inside Front Cover
Du Pont de Nemours, E. I., & Company	8
Edgar Brothers Company	19
Edgar Plastic Kaolin Company	19
Edward Orton, Jr., Ceramic Foundation	16
Frazier-Simplex, Inc.	15
Hammill & Gillespie, Inc.	23
Hartford-Empire Company	19
Hommel, O., Company	22
Kentucky Clay Mining Co.	13
Lancaster Iron Works, Inc.	3–4–5
Louthan Mfg. Co.	2
McDanel Refractory Porcelain Company	21
Metakloth Company	23
Metal & Thermit Corporation	Outside Back Cover
Montgomery Porcelain Products Co.	25
Norton Company	18
Orton, Edward, Jr., Ceramic Foundation	16
Pacific Coast Borax Company	13
Paper Makers Importing Company	21
Pennsylvania Salt Mfg. Co.	17
Porcelain Enamel & Mfg. Company	20
Potters Supply Company	22
Professional Directory	20
Proctor & Schwartz, Inc.	20
Pyrometer Instrument Co.	19
Ransome Concrete Machinery Co.	7
Solvay Sales Corporation	22
Spinks, H. C., Clay Company	Inside Back Cover
Swindell-Dressler Corp.	13
United Clay Mines Corp.	13
Vitro Mfg. Company	16
Willson Products, Inc.	21
Wilson, H. W., Company	20
Wyodak Chemical Co.	12



COVER'S TWIN FILTER RESPIRATOR

★ Here is COVER'S famous DUPOR No. 4. It's a prime favorite with users everywhere because it provides economical, low cost protection where dust hazards prevail!
★ Made of soft rubber, foldable, reversible, fits any shaped face. Equipped with face cloth. Double filter apertures of 7½ sq. in. Extreme light weight too!
★ Try this unusual respirator in your own plant!

Sample Respirator Postpaid for only

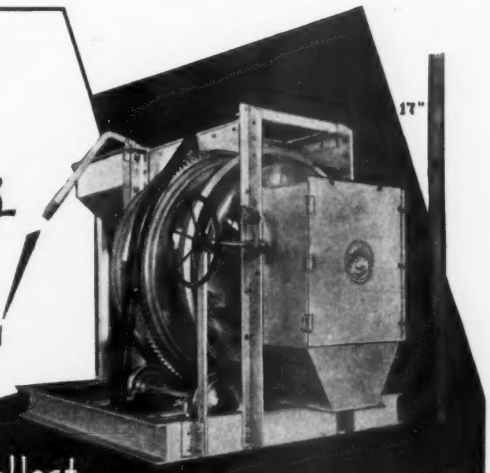
$1.50

INDUSTRIAL SAFETY EQUIPMENT ASSOCIATION

H. S. COVER

1931 Chippewa St., South Bend, Ind.

Ransome cordially invites you to use, Free!



The smallest of the Largest Mixers

RANSOME extends this unusual invitation to use their new laboratory size Dustproof Mixer for making experimental mixing tests.

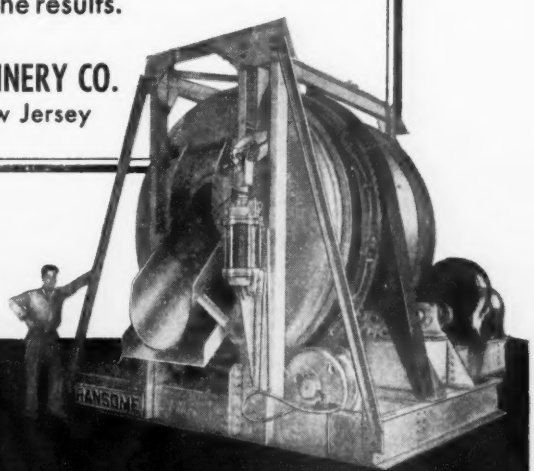
This model, though only 17" high, is an exact replica of RANSOME Industrial Mixers with the exception that the mixing drum is made of glass so that you may *actually see* the famous RANSOME Mixing Action in operation, and also observe the clean and complete discharge of the finest of materials out of the drum.

Write now for your chance to use this intriguing laboratory size mixer for your very own laboratory tests or send us your materials with instructions so we can make the test and send you the results.

Industrial Division
RANSOME CONCRETE MACHINERY CO.
Dunellen New Jersey

Mixer Specialists for over 88 years

RANSOME REG. U.S. PAT. OFF. AMERICA'S FIRST MIXER



260 cu. ft. Zinc Furnace Charge Mixer

Ransome INDUSTRIAL MIXERS
DEPENDABLE • ECONOMICAL • LONG LIVED

IT'S GOING TO BE *the Greatest* COLOR YEAR IN HISTORY

Prepare For It Now
with these
DU PONT
COLORS and DECORATIONS
Precious Metal Decorations • Glass Colors, acid- and alkali-resistant • Color Oxides Tin Oxide • Body, Slip and Glaze Stains Raw Materials

Colorful China and Glass To Be In Great Demand

"IT'S going to be the greatest color year in history." This and similar remarks were often repeated at the Pittsburgh and Chicago china and glass exhibits. Growing consumer demand for Color, Style and Decoration even in the moderate price field is making itself felt all along the line.

INEXPENSIVE WARE CAN BE COLORFUL

Today, even inexpensive ceramic and glass ware can be given the strong sales appeal of beautiful, distinctive decoration. Research has created new ceramic materials . . . modified old ones for more effective use . . . found ways to employ materials that once were far too costly . . . developed colors and decorations suitable for modern production.

CURRENT OFFERINGS DISTINCTIVE

For designers, recent improvements in ceramic colors have brought a new means of expression, making possible new patterns and effects. In the development of acid-and alkali-resistant colors for glass, over-glaze colors for china, and in the general improvement of materials suitable for modern production, du Pont research has given the designer a wide range of shades, outstanding in brilliance and durability.

DU PONT CERAMIC SERVICE

Through cooperation with designers and manufacturers, du Pont ceramic materials have been improved in quality and closely adapted to their particular uses. With more than 8,000 permanent color standards, the du Pont Color Library assures manufacturers exact matching of color shades. Our Ceramic Service Division will gladly work with you in applying du Pont Pre-Tested Materials.

DU PONT
REG. U. S. PAT. OFF.

The R. & H. Chemicals Department
E. I. DU PONT DE NEMOURS & COMPANY, INC.
Wilmington, Delaware

District Sales Offices: Baltimore, Boston, Charlotte, Chicago, Cleveland, Kansas City, Newark, New York, Philadelphia, Pittsburgh, San Francisco

Abrasives
Carborundum Co. (*Carborundum and Aloxite*)
Chicago Vitreous Enamel Products Co.
The Hommel Co., O., Inc.
Norton Co. (*Alundum-Crystolon*)

Air Conditioning Systems
Frazier-Simplex, Inc.

Aloxite (Refractory Products)
Carborundum Co.

Alumina (Hydrate and Calcined)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Alumina (Fused) Brick and Tile
Electro Refractories & Alloys Corp.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Aluminum Oxide (Calcine)
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Aluminum Oxide (Fused)
Carborundum Co.
Electro Refractories & Alloys Corp.
Harshaw Chemical Co.
Norton Co.
The Vitro Mfg. Co.

Alundum (Refractory Products)
Norton Co.

Ammonium Bicarbonate
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Solvay Sales Corp.

Ammonium Bifluoride
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Ammonium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Antimony Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Antimony Sulphide
Foote Mineral Co.

Arches (Interlocking, Suspending, and Circular)
Frazier-Simplex, Inc.

Arsenic
Harshaw Chemical Co.

Automatic Brick Car Loaders
Lancaster Iron Works, Inc.

Ball Mills
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Hardinge Company, Inc.
The Hommel Co., O., Inc.
McDanel Refractory Porcelain Co.
The Vitro Mfg. Co.

Ball Mills (Laboratory Type)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Hardinge Company, Inc.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Barium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Batch Systems
Frazier-Simplex, Inc
Lancaster Iron Works, Inc.

Batts
Carborundum Co. ("*Carbofrax Aloxite*")
Denver Fire Clay Co
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)

Beryl
Foote Mineral Co.

Bichromate of Soda
Harshaw Chemical Co.

Bitstone
Potters Supply Co.

Blocks (Refractory)
Carborundum Co.
Chicago Vitreous Enamel Product Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Norton Co.
The Vitro Mfg. Co.

Body Stains
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Bone Ash
Harshaw Chemical Co.

Borax
American Potash & Chemical Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Borax Glass
American Potash and Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boric Acid (Anhydrous)
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boron Carbide
Norton Co.

Brick Machines (also Barrows, Molds)
Lancaster Iron Works, Inc.

Brick (Refractory)
Carborundum Co. ("*Carbofrax Aloxite*")
Chicago Vitreous Enamel Product Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.
The Vitro Mfg. Co.

Cadmium Sulphide
Harshaw Chemical Co.

Carbofrax (Refractory Products)
Carborundum Co.

Carbonates (Barium, Lead)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Castings
Lancaster Iron Works, Inc.

Castings (Abrasive Resisting)
Bethlehem Steel Co.

Caustic Potash
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
Solvay Sales Corp.

Caustic Soda
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
The Vitro Mfg. Co.

Cements
Carborundum Co.
Chicago Vitreous Enamel Product Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Pennsylvania Salt Mfg. Co.

Ceramic Chemicals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
The Porcelain Enamel and Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Cerium Oxide
Foote Mineral Co.

Chromite (Natural Chromate of Iron)
Foote Mineral Co.

Chromium Oxide
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Clay (Ball)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay (Block)
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Clay (China)
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay—Cleaners, Feeders
Lancaster Iron Works, Inc.

Clay (Electrical, Porcelain)
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Enamel)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Metal & Thermit Corp.
Paper Makers Importing Co.
The Porcelain Enamel & Mfg. Co.
Spinks, H. C., Clay Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay (Fire)
Denver Fire Clay Co.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Paper Makers Importing Co.
Potters Supply Co.

Clay (German Vallendar)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
The Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay Miners
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Potters)
Denver Fire Clay Co.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Process Equipment)
Hardinge Company, Inc.
Lancaster Iron Works, Inc.

Clay (Sagger)
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Wad)
Kentucky Clay Mining Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.

Clay (Wall Tile)
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Paper Makers Importing Co.
Spinks H. C., Clay Co.
United Clay Mines Corp.

Cleaners
Pennsylvania Salt Mfg. Co.
The Porcelain Enamel and Mfg. Co.

Cleaners, Chemical
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.

Clocks (Gauge Board)
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.

Cobalt Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.,
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cobalt Sulphate
Harshaw Chemical Co.

Colors
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cones
The Edward Orton, Jr., Ceramic Foundation

Conveying Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Copper Oxide
Harshaw Chemical Co.

Corhart
Corhart Refractories Co.

Cornwall Stone (Imported)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.

Crucibles (Filter, Melting, Ignition)
Carborundum Co.
Denver Fire Clay Co.
Norton Co.
Potters Supply Co.

Crushers (Clay)
Lancaster Iron Works, Inc.

Cryolite (see Kryolith)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Decorating Supplies
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Disintegrators
Hardinge Company, Inc.
Lancaster Iron Works, Inc.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Drying Machinery
Frazier-Simplex, Inc.
Hardinge Company, Inc.
Lancaster Iron Works, Inc.
Proctor & Schwartz, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enameling Equipment (Complete)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Enameling Furnaces
Carborundum Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Electro Refractories & Alloys Corp.
The Hommel Co., O., Inc.
Lancaster Iron Works, Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.
Bethlehem Steel Co.

Enameling Muffles
Bethlehem Steel Co.
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Norton Co. (*Alundum*)

Enameling (Practical Service)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamel Oxide
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Enamels (Porcelain)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Equipment (Porcelain Enameling)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The DeVilbiss Co.
Hardinge Company, Inc.
The Hommel Co., O., Inc.

Exhaust Systems
The DeVilbiss Co.

Feldspar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Spinks, H. C., Clay Co.

Flint
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.

Flint Pebbles
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Floors (Non-Slip)
Norton Co.

Fluorspar
Harshaw Chemical Co.

French Flint
Paper Makers Importing Co.

Frit
Allied Engineering Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Frosting Mixtures
Harshaw Chemical Co.

Fuel Oil Systems and Control, Stokers
Bethlehem Steel Co.
Frazier-Simplex, Inc.

Furnaces
Allied Engineering Co.
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
Swindell-Dressler Corp.

Furnaces-Enameling
Swindell-Dressler Corp.

Glass Bending Ovens, Glass Decorating Machines
Frazier-Simplex, Inc.

Glass Equipment
Hartford-Empire Co.
Lancaster Iron Works, Inc.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Glaze Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.

Goggles
Cover, H. S.
Willson Products, Inc.

Gold
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.

Du Pont de Nemours, E. I., & Co., Inc., R. H. & Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Gold Decorations
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Granulators
Hardinge Company, Inc.
Lancaster Iron Works, Inc.

Grinding Wheels
Carborundum Co. (*Carborundum and Alorite*)
Chicago Vitreous Enamel Product Co.
Norton Co. (*Alundum-Crystolon*)

Hearths
Carborundum Co. (*Carbofrax* heat treating)
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co. (*Crystolon*)

Hearths (Fused Al_2O_3, SiC)
Electro Refractories & Alloys Corp.

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

Hose (Air and Fluid)
The DeVilbiss Co.

Hydrofluoric Acid
Harshaw Chemical Co.

Iron Chromite
Harshaw Chemical Co.

Iron (Enameling)
American Rolling Mill Co.
Bethlehem Steel Co.

Iron Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Kaolin
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
United Clay Mines Corp.
The Vitro Mfg. Co.

Kellog AA Refractories
Electro Refractories & Alloys Corp.

Kilns, China (Decorating)
Allied Engineering Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
Swindell-Dressler Corp.

Kilns-(Electric, Circular, Tunnel)
Allied Engineering Co.
Swindell-Dressler Corp.

Kiln Furniture (Silicon Carbide, Semi-Silicon Carbide) (Refractory)
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.

Kyanite
Celo Mines, Inc.

Kryolith (See Cryolite)
Pennsylvania Salt Mfg. Co.

Laboratory Ware
Norton Co.

Lehr Tile (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Electro Refractories & Alloys Corp.

Lehrs
Frazier-Simplex Inc.
Swindell-Dressler Corp.

Lehrs (Electric or Fuel Heated)
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehr Loaders
Frazier-Simplex, Inc.

Linings (Furnace Refractory, Block Refractory Plate, Brick and Tile)
Carborundum Co.
Chicago Vitreous Enamel Product Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.
The Vitro Mfg. Co.

Lithium Carbonate
Foote Mineral Co.

Lithium Minerals
Foote Mineral Co.

Magnesia (Fused)
Electro Refractories & Alloys Corp.
Norton Co.

Magnesia (Sintered, Calcined)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.

Magnesite
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Magnesite Calcined
Foote Mineral Co.

Magnesium Carbonate
Harshaw Chemical Co.

Manganese
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Manganese Dioxide
Foote Mineral Co.

Manganese (Oxide)
Ceramic Color & Chemical Mfg. Co.
Corhart Refractories Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.

Masks (Breathing)
The DeVilbiss Co.
Willson Products, Inc.

Metals (Porcelain Enameling)
American Rolling Mill Co.
Bethlehem Steel Co.

Microscopes (Polarizing)
Bausch & Lomb Optical Co.

Minerals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Mixers
Ransome Concrete Machinery Co.

Mixers (Batch)
Lancaster Iron Works, Inc.

Mold Sanders
Lancaster Iron Works, Inc.

Muffles (Furnace)
Allied Engineering Co.
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Norton Co.

Muffles (Laboratory)
Electro Refractories & Alloys Corp.

Mullite (Refractories)
Electro Refractories & Alloys Corp.

Muriatic Acid
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.

Needle Antimony
Harshaw Chemical Co.

Nickel Salts
Harshaw Chemical Co.

Nitrates (Cobalt, Sodium)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Nitre
Harshaw Chemical Co.

Non-Gro Refractories
Electro Refractories & Alloys Corp.

Norbide (Norton Boron Carbide)
Norton Co.

Olivine
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Opacifiers
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Overglaze Colors
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Oxides
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
Metal & Thermit Corp.
Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Palladium Decorations
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Pins
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
Louthan Mfg. Co.
Potters Supply Co.

Pins (Tile Setter)
Louthan Mfg. Co.

Platinum Decorations
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Polariscopes
Bausch & Lomb Optical Co.
Frazier-Simplex, Inc.

Porcelain Enameling Service (Practical)
American Rolling Mill Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Hardinge Company, Inc.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Porcelain Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Potash (Carbonate)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Solvay Sales Corp.
The Vitro Mfg. Co.

Producer Glass Plants
Frazier-Simplex, Inc.

Pug Mills
Lancaster Iron Works, Inc.

Pyrites (Natural Iron Sulphide)
Foote Mineral Co.

Pyrometer Tubes
Carborundum Co.
Electro Refractories & Alloys Corp.
Montgomery Porcelain Products Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
Denver Fire Clay Co.
McDanel Refractory Porcelain Co.
Norton Co.

Pyrometers (Optical, Radiation, Surface, Immersion, Needle)
Pyrometer Instrument Co.

Pyrometric Cones
The Edward Orton, Jr., Ceramic Foundation

Racks, Firing (Refractory)
Louthan Mfg. Co.

Raw Material Handling Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Refractometers
Bausch & Lomb Optical Co.

Refractories
Carborundum Co.
Corhart Refractories Co.

Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Norton Co.

Refractory Materials
Carborundum Co.
Chicago Vitreous Enamel Product Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Norton Co.
Titanium Alloy Mfg. Co.

Represses (Automatic)
Lancaster Iron Works, Inc.

Respirators
Chicago Vitreous Enamel Product Co.
Cover, H. S.
The DeVilbiss Co.
The Hommel Co., O., Inc.
Willson Products, Inc.

Rutile
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Saggers
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
Potters Supply Co.

Salt Cake
American Potash & Chemical Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.

Sandblast Helmets
Willson Products, Inc.

Sand Grinder and Sifters
Lancaster Iron Works, Inc.

Saponin
The Hommel Co., O., Inc.

Selenite of Sodium
Drakenfeld, B. F., & Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Selenium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Setters (Tableware)
Louthan Mfg. Co.

Sheets (Enameling Iron)
American Rolling Mill Co.
Bethlehem Steel Co.

Silica (Fused)
Electro Refractories & Alloys Corp.
The Hommel Co., O., Inc.

Silicate of Soda
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
The Hommel Co., O., Inc.
Harshaw Chemical Co.

Silicon Carbide
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Silicon Carbide Firesand
Carborundum Co.

Sillimanite Refractories
Electro Refractories & Alloys Corp.

Slabs (Furnace)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Soda Ash
American Potash and Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
The Vitro Mfg. Co.

Sodium Antimonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Sodium Fluoride
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Sodium Metasilicate
Harshaw Chemical Co.

Sodium Nitrite
Harshaw Chemical Co.

Sodium Silica Fluoride
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Sodium Uranate
Harshaw Chemical Co.

Soot Blowers
Frazier-Simplex, Inc.

Special Machines
Frazier-Simplex, Inc.

Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Spray Booths
The DeVilbiss Co.

Spraying Equipment
The DeVilbiss Co.

Spurs
Louthan Mfg. Co.
Potters Supply Co.

Stacks
Lancaster Iron Works, Inc.

Steel Plate Construction
Bethlehem Steel Co.
Lancaster Iron Works, Inc.

Stilts
Louthan Mfg. Co.
Potters Supply Co.

Sulfuric Acid
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.

Talc
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.

Tanks
Frazier-Simplex, Inc.

Tank Blocks
Corhart Refractories Co.

Tanks (Pickle)
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.

Tanks for Raw Material Steel or Concrete
Bethlehem Steel Co.
Lancaster Iron Works, Inc.

Tile (Floor)
Norton Co.

Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile Setter Pins
Louthan Mfg. Co.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile (Wall)
Denver Fire Clay Co.

Tin Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Titanium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Tri Sodium Phosphate
Harshaw Chemical Co.

Trucks
Lancaster Iron Works, Inc.

Tubes (Insulating)
Carborundum Co.
Louthan Mfg. Co.
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
Carborundum Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
McDanel Refractory Porcelain Co.
Norton Co.

Uranium Oxide
Harshaw Chemical Co.

Uranium Oxide (Yellow-Orange-Black)
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Vitro Mfg. Co.

Water Softening Plants
Frazier-Simplex, Inc.

Wet Enamel
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Whiting
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Winding Drums
Lancaster Iron Works, Inc.

Zinc Oxide
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Zircon
Foote Mineral Co.

Zirconia
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Zirconium Oxide
Foote Mineral Co.

Zirkite (Natural ZrO_2)
Foote Mineral Co.

PURE WYOMING BENTONITE

(Colloidal Clay)

An ideal medium of high absorption properties, used to increase plasticity of low plastic or non-plastic minerals or clays—also excellent for use in preparing suspensions, emulsions and for the addition of bond.

THE WYODAK CHEMICAL COMPANY

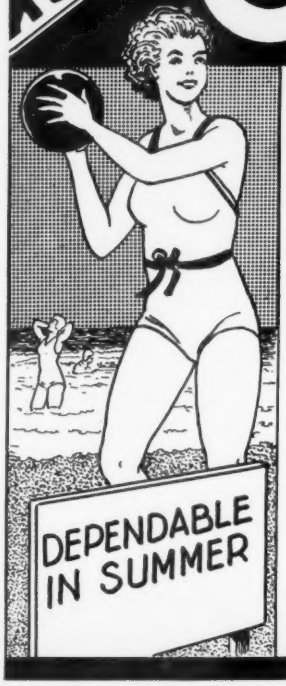
4600 E. 71st St. Cleveland, Ohio

Branches—New York—Detroit—Chicago—Los Angeles—Richmond, Va. Mines—Upton, Wyo.

K·C·M·Co.

CLAYS

BALL.....
SAGGER
WAD.....



During any WEATHER we can ship Promptly UNIFORM, STANDARDIZED CLAYS with no EXCESSIVE MOISTURE.

Ask us for Samples

KENTUCKY CLAY MINING COMPANY, INC.
MAYFIELD, KENTUCKY

HIGH GRADE CLAYS

FOR EVERY CERAMIC NEED

UNITED CLAY MINES CORPORATION

GENERAL OFFICES TRENTON, NEW JERSEY

All Types of Circular and Straight Tunnel Kilns

SWINDELL-DRESSLER CORPORATION

Post Office Box 1888 **Pittsburgh, Pa.**

Lehrs and Enameling Furnaces, Electric and Gas Fired

Full Details Furnished on Request

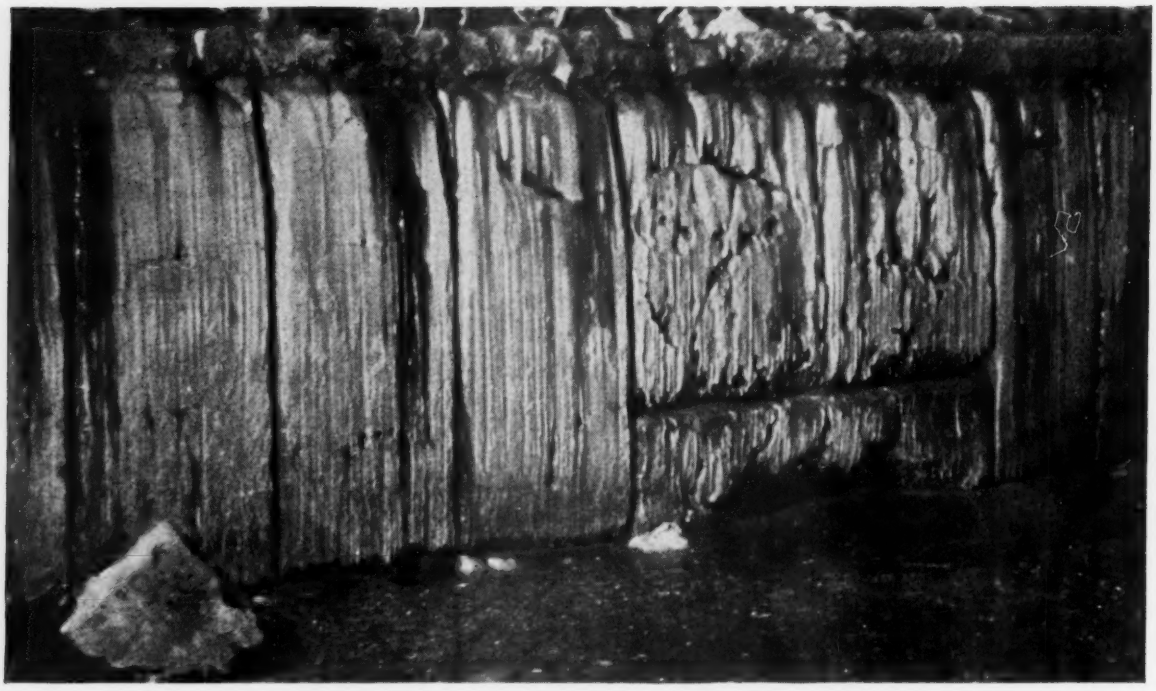
BORAX *Guaranteed 99½%–100% Pure* BORIC ACID

Select the Brand which has back of it years of *successful use* by experienced Ceramists

Pacific Coast Borax Co., New York

Chicago

Los Angeles



LONGER LIFE PLUS HEAVIER PULL EQUALS LOWER GLASS COSTS

Total Life . . . . . 678 days (including idle days)

Glass Produced . . 45,825 total tons produced at feeders

Gas Consumed . . 344,550,000 cubic feet total (1050 B.t.u.)

Idle Days 49

Operating Days . . 629

Melting Area . . . 392 square feet

20% cullet in batch

THE data above was turned over to us by the operators of a balanced Corhart Electrocast* tank which was shut down according to a prearranged schedule on December 22, 1937. This tank melted clear flint glass for a general line of packers and proprietary ware.

Please note that this tank averaged 72.85 tons of glass per day, melting one ton of glass for each 5.38 square feet of melting area. Please note also that, without any correction for idle days or heating-up period, *the total fuel consumed was 7518.8 cubic feet per ton of glass.*

Each combustion engineer has his own method of figuring fuel consumption per ton of glass for operating days. There is sufficient basic data at the left for each one to arrive at his own answer. With our own method, we find the gas consumption per ton of glass produced on operating days to be 7192.3 cubic feet.

The salient features of this record are the low fuel cost, long life, satisfactory operation and the extraordinarily high rating.

Please permit us to repeat again that Corhart does not "claim credit" for low fuel consumption and high rating—except insofar as these factors are affected by the use of a refractory that can *stand the gaff* of a heavier pull over a longer period of time . . . We submit that Corhart Electrocast *is that refractory.*

Corhart Refractories Co., Incorporated, 16th & Lee Sts., Louisville, Ky. *In Europe:* L'Electro Refractaire, Paris. *In Japan:* Asahi Glass Co., Tokio.

QUALITY ECONOMY ENDURANCE

CORHART ELECTROCAST REFRACTORIES

*Manufactured under and by an exclusive patented process.

SHOULD THE DOWNDRAFT PERIODIC KILN BE ROUND OR RECTANGULAR?*

By W. D. Richardson

Abstract

Some facts are reviewed in the history of the introduction, development, and extensive use of downdraft periodic kilns in the United States. The advantages and disadvantages of the round kiln and of the rectangular kiln are listed. The chief defect of the rectangular kiln, frequent repairs of the crown, has been eliminated by the durable flat suspended arch. Special features of the latest development, a mortarless, expansible, sealed arch, are described and illustrated.

I. Prevalence of the Round Kiln in the United States

From a survey of the plants of manufacturers of structural clay products in the United States or from a review of illustrated descriptions of such plants in the trade journals, this question seems to have been decided in this country preponderately in favor of the round kiln. Compare this with the pictures of brick and tile plants in Europe and the absence of the round kiln is noteworthy. Some years ago, G. Wson Cronquist[1] toured the United States, inspecting brickmaking plants. He expressed surprise at the kilns in use, and, in an account of his visit, published in the *Clay-Worker*, he said, "In all Sweden I do not know of a round kiln being used for firing brick."

II. Some Historical Facts

Fifty years ago, building brick in this country were almost universally fired in updraft kilns, chiefly scove-type, but in some cases with permanent walls and furnaces. For face brick, or pressed brick, as they were then called, especially those made by the then recently developed dry-press process, the updraft kiln was found to be impractical by reason of the small percentage of the desired qualities obtainable, hard-fired, straight, and of dependable color or shade. So the downdraft kiln came into general use for such products.

Graves, a famous engineer of the Hydraulic-Press Brick Co., designed a rectangular downdraft kiln, in which dry-press brick were fired successfully up to the present day. Anthony Ittner and a few other pioneers in the dry-press process also built rectangular downdraft kilns. All of these kilns had a single high stack for a battery of kilns. Then came Eudaly, the first president of the National Brick Manufacturers Association, with the multiple-stack kiln and chimneys in the side walls of the kiln between the furnaces and on the corners. Through his vigorous promotion and salesmanship, this rectangular downdraft kiln came into quite general use in this country by manufacturers of pressed brick. The manufacturer paid Eudaly $500 to $2000 for the yard right and a set of blue prints, and also paid his man for superintending construction.

In those days, the round kiln was used only for sewer pipe and drain tile. Pike's kiln proved to be so satisfactory for drain tile that it gradually came into use for firing brick, especially dry-press and stiff-mud brick for exteriors, and in a few years the round kiln became the prevalent one for such products, rather than the rectangular kiln, in the further expansion of the industry.

Note: Old members of the N.B.M.A. will remember Pike, who was a regular attendant at Association meetings as well as all meetings of state associations of brick and tile manufacturers, with a wood model of his kiln.

III. Advantages and Disadvantages of the Round Kiln

(1) Advantages

(1) Cost of construction less per unit of capacity, because the bands to hold up the crown cost less than the bracing required for the rectangular kiln.

Note: A brick dealer in a southern city, who had been handling Ohio buff and gray face brick, found, underneath the red-firing clay of the river bottoms used for common brick, a white clay (a secondary kaolin deposit) that fired to light colors. He and his partner leased the old brick plant and clay property, purchased some second-hand dry-press machinery, erected it under a cheap wood building, and began making face brick. They had no money for engineering service or blue prints. For firing their brick, they built two or three round kilns, using the old brick on the yard, laying them up with clay mortar by negro work-

* Presented at the Fortieth Annual Meeting, American Ceramic Society, New Orleans, La., March 27–April 2, 1938 (Structural Clay Products Division). Received February 2, 1938.

[1] Representing the Association of Swedish Brick Industry and *Tegel*, the organ of that Association.

men at a wage of $1.00 for a long day's work. They found some old wire rope, which they wound around the kiln for bracing. Their books showed that the entire cost of a kiln was a little less than $160! They produced acceptable face brick of light color that met the requirements of their market. Unfortunately, after a few months' operation, a flood of the Savannah River carried their entire plant downstream, wrecking everything, and putting them out of business.

(2) Less expensive to keep in repair because the inner wall of fire brick, which forms an arch of the circular wall, is not pulled into the bags so much. The circular crown, moreover, stands up longer, even after considerable sagging and bulging.

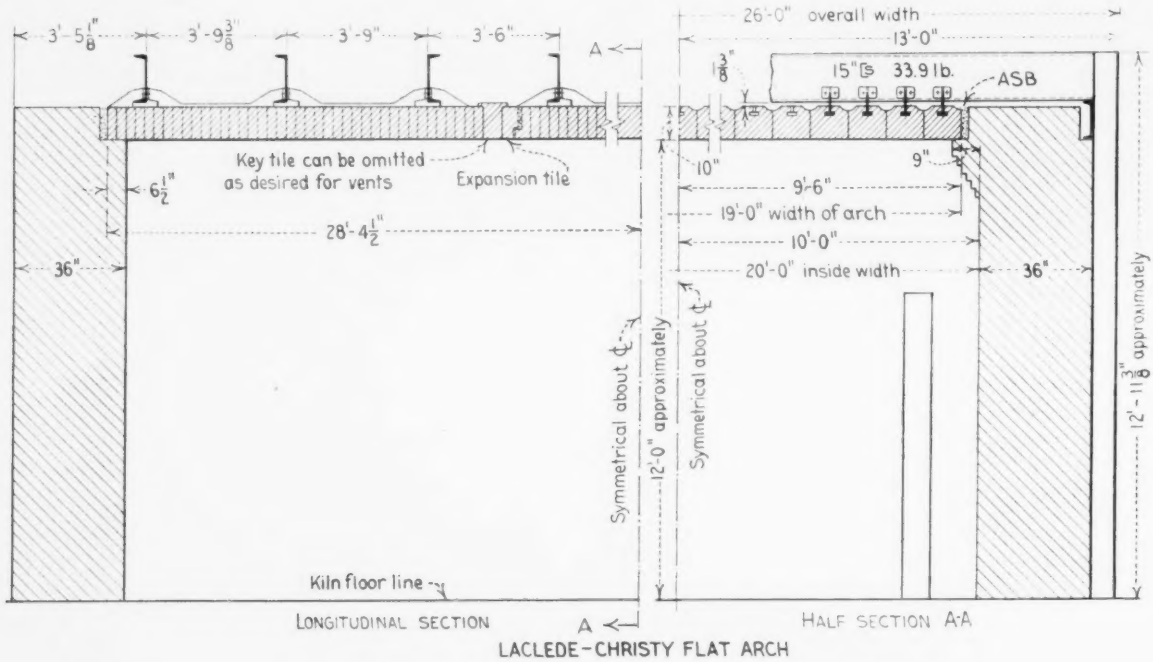
(6) Inconvenient for observing the effect of the fire where it first strikes the setting; in practice, no attempt is made to make such observations at frequent intervals.

(7) Impossible to view the intensity and effect of more than one fire at a time and make comparison for intelligent firing.

IV. Advantages and Disadvantages of the Rectangular Kiln

(1) Advantages

(1) Utilizes yard space more economically and permits a more convenient arrangement of plant.



LACLEDE-CHRISTY FLAT ARCH
Fig. 1

These concise statements really cover all of the special advantages of the round kiln.

(2) Disadvantages

(1) Does not utilize yard space economically.

(2) Is awkward for coal distribution to furnaces and does not permit mechanical distribution.

(3) Not so convenient for filling from drier cars or for uniform setting around walls.

(4) Doors must be narrow, which prevents loading into wagons or delivery trucks inside of kiln.

(5) Awkward to protect kiln and firing ground by roof, such protection being now more important than was formerly thought.

(2) Permits wider doors, with greater convenience in setting from drier cars and in emptying by loading into delivery trucks inside the kiln. There may be two doors in each end for greater convenience in setting from drier cars and in emptying by barrows or small lifting trucks for transportation to stock sheds or railroad car.

(3) Kilns and firing ground can be economically covered with a ventilating roof, thus protecting the kiln and firemen and saving fuel.

(4) Flaring peepholes in each corner just above top of bags permit observations of all fires on each side at one view and of the effect on the setting in front of each bag and, therefore, more intelligent regulation of fires (Fig. 4).

(5) Permits the use of a practical, suspended arch, supported independently of kiln walls, that will not sag or get out of level for years.

(2) Disadvantages

(1) Side walls must be bonded better to prevent excessive bulging in front of the fires.

(2) Side walls must be firmly braced against the thrust of the crown, if a circular arch is used. Even with proper rise of arch and the best construction, the segment crown can not be made as

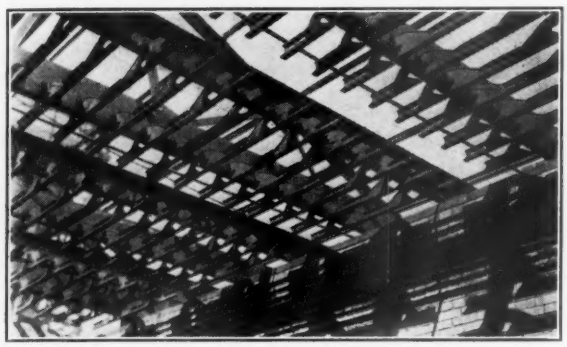


FIG. 2.

durable as the circular crown of the round kiln. But this defect can be practically overcome by the flat suspended arch.

NOTE: It is not within the scope of this paper to discuss the design or construction of any part of the kiln except the crown, though it is evident that 75% of those who build and operate downdraft periodic kilns do not know the best type of furnace for their fuel or the most efficient and economical flue system for best results.

V. Durable Crown for Rectangular Kilns

What has retarded the extensive use of the rectangular kiln more than anything else has been the delay and expense in repairing crowns. This has not been so serious in some cases, where the arch is given the proper rise and the construction well done, all the brick of the most approved dimensions and tapered to the true arc, and all fired hard enough to prevent undue shrinkage and sagging of the heels above the fires, and the walls well braced. Yet it is well known that rectangular kilns, as generally built, do require frequent repairs from sagging and bulging of the crown, so that a part or all must require replacing of the forms, raising the arch, and re-laying the brick. This work may be temporarily postponed by setting up piers of hard-fired brick under the sagged places. If neglected too long, the sagged portion of the crown may fall before the end of a firing or immediately after, or, worse yet, during the emptying when men are at work in it.

But this objection to the rectangular kiln has been entirely eliminated by the development of the suspended flat arch. Some form of the suspended arch has been commonly used over industrial furnaces for many years, and there are well-known patented designs on the market. The suspended arch, moreover, has been used on rectangular brick kilns for a long time. The Laclede-Christy Clay Products Company used the suspended arch on rectangular kilns for years with decided success, though they later adopted the tunnel kiln. Figure 1 shows cross and longitudinal sections of their arch. Figure 2 shows a kiln just before the suspended brick have been put in place. Figure 3 shows one of the kilns being set. The kiln is 20 by 82 feet and "has been in service many years with absolutely no repairs of any kind." This arch requires heavy steel beams, 15-inch channels across the kiln to carry the weight of the castings, 12 inches apart, upon which the special brick are supported.

VI. The Richardson Suspended Arch

This arch is the result of much study, investigation, and experimenting, with the main purpose of developing a practical, satisfactory arch for tunnel kilns to meet the following specifications.

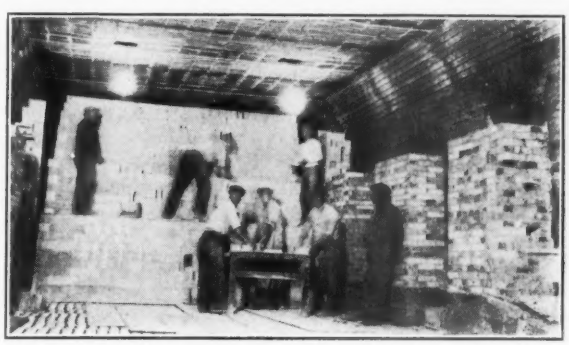


FIG. 3.

(1) The arch remains permanently horizontal at the level at which it was set and causes no delay or expense for repairs.

(2) The arch is expansible, flexible, and mortarless, and requires no expansion joints and no mortar.

(3) The arch is effectively sand-sealed against the escape of kiln gases.

(4) The arch does not rest on the kiln walls,

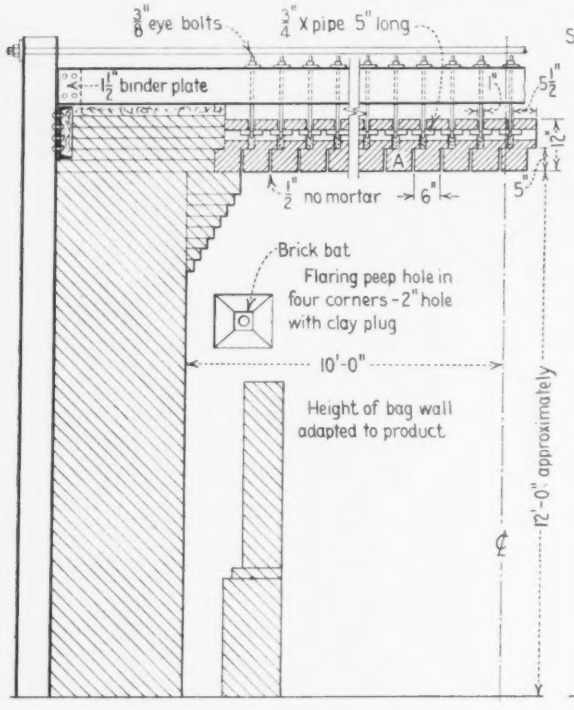
but is supported independently, so as not to be affected by any settling or expansion of brickwork.

(5) The flat arch permits a wider kiln.

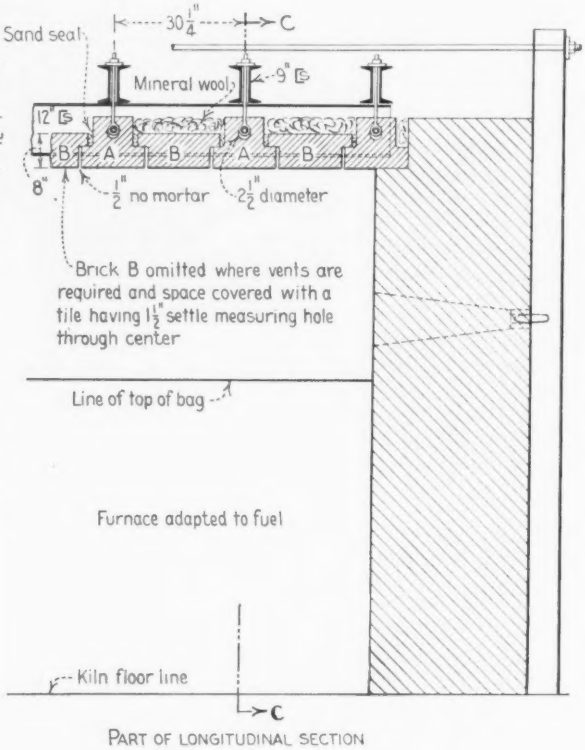
(6) Costs less than other flat arches.

Figure 4 shows a half cross-section and Fig. 5 part of a longitudinal section.

By this means of suspension, the beams do not have to support heavy castings, as required in other flat arches, and also, being farther removed from the arch, are not affected by the heat of the kiln. The supported members, *B*, are covered with rock wool or other insulating material to



HALF CROSS-SECTION C-C
Fig. 4



PART OF LONGITUDINAL SECTION
Fig. 5

The arch is made up of two shapes of fire brick, a suspended member, *A*, and the member, *B*, supported upon it. Member *A* has a $2^1/_2$-inch hole through the upper part and is suspended on steel beams, a pair of 9-inch channels (by means of $^3/_8$-inch eye bolts), the eye encircling a $^3/_4$-inch X pipe, 5 inches long, in the hole of the brick, and the upper end of the bolt passing through a steel plate washer and nut on top of the channels.

prevent loss of heat by radiation. The kiln, of course, is protected by a shed, having a monitor over the center for light and ventilation when required. The firing ground should also be covered to protect men and fuel.

366 KING AVENUE
COLUMBUS, OHIO

STOKER-FIRED ROUND DOWNDRAFT KILNS*

By John H. Isenhour

Abstract

This paper deals with the adaptability, labor-saving, fuel-saving, and other advantages of stoker firing on round downdraft kilns and various other types.

I. Introduction

For the past four years, experiments have been conducted to increase the quality of ware by improving firing methods and at the same time to make the firing more efficient. The products manufactured are common brick, face brick, and hollow building tile. The material has a medium firing range which matures at cone 1.

The kilns are round downdraft type with dead-bottom furnaces fired with coal. The old method was to fire at intervals of 30 and 40 minutes with 2 to 4 shovels of relatively low volatile coal.

The results of this type of firing were flashed brick, nonuniform firings, and often overfired brick, even though pyrometer and draw samples were used to determine the finish; 1100 pounds of coal were consumed per 1000 brick.

After varying the time intervals of firing with different amounts of coal, the most practical and efficient method was found to be 15-minute firings with a small shovel of coal of not more than 10 pounds. If at any time it becomes necessary to raise the temperature rapidly, the firing schedule is changed to 10 or 12 minutes, but the amount of coal fired in each furnace at one time never exceeds the small shovelful, and the draft is increased slightly to burn the coal faster. By firing on this schedule, a high volatile and low ash coal is advantageous.

Flashed and overfired ware was eliminated and firings were uniform. The amount of coal used per 1000 brick was decreased from 1100 to 750 pounds, an approximate saving of 30%.

II. Stoker Firing

One kiln was selected for stokers to determine their practicability for round downdraft kilns. The stoker-fired kiln contained 60,000 brick and was fired with eight furnaces.

The underfeed type of house stoker was used. Each stoker had its individual draft fan and was individually driven by a $^1/_4$-h.p. motor. The coal feed was variable, from 20 to 50 pounds per hour; $1^1/_2$-inch nut and slack coal was used in the stokers. Each stoker was equipped with small wheels to facilitate its moving.

The stokers were installed in the furnaces of the kiln, similar to their use in a house furnace, except that the bottom of the kiln furnace was left open so that the stoker could be pulled out and put in at any time during firing.

Each stoker required approximately 10 minutes to install from one kiln to another. The stokers required little attention after the feed control was regulated at the different stages of firing.

The clinkers were removed from the fire plates on the edge of the retort every 8 to 12 hours, without disturbing the fuel bed or affecting the temperature of the furnace. The hoppers were filled with coal once every eight hours.

Using stokers to each furnace for four or five kilns each week would require quite an investment; experiments were therefore conducted to reduce the number of stokers by one-half.

The bag walls or flash walls on the inside of the kiln were rebuilt to give a better distribution of gases. Because one furnace has to give out heat equivalent to two furnaces, it was necessary to build one bag wall long enough to take in the two furnaces.

The bag wall is high at the furnace furnishing heat, gradually diminishing to one foot toward the cold furnace. By decreasing the resistance in the bag wall toward the place the heat is most needed, the gases are distributed into the kiln proper by the induction fan.

III. Type of Stokers

The success of stoker-fired kilns will depend upon the correct type of stoker and proper installation in the furnace.

The *stoker capacity* should be approximately 20% greater than that needed. The hopper should be built low to enable clinkers to be removed from the top door of furnace, and framework should be lightweight to facilitate moving

* Presented at the Thirty-Ninth Annual Meeting, American Ceramic Society, New York, N. Y., March 24, 1937 (Structural Clay Products and Terra Cotta Divisions).

from kiln to kiln. The transmission driving the feed screw should be powerful, while the flights of the screw should increase with its length so as not to pack coal in the feed shaft. There are few stokers on the market that have a feeding screw built correctly to feed nut and slack coal; if the flights of the screw do not increase with its length, the nut coal will tend to crush and slack coal will tend to pack.

The forced-draft fans on the stokers should have ample volume to burn the amount of coal fed and sufficient pressure to burn fuel in a 2-foot fuel bed. Each stoker should be equipped with an automatic volume control on the air duct to give a correct volume of air for the amount of coal fed.

An ordinary kiln furnace will suffice for the installation of a stoker. The grate area of the furnace is not important in an underfeed stoker. The size of retort, the amount of coal fed, and the air volume determine the capacity. The distance between the retort and top of the furnace is important and should not be less than 40 inches. The retort should extend into the furnace as far as possible, thus building up a greater pressure in the kiln instead of in the furnace.

Nut and slack coal can be used in place of prepared coal and the cost is less.

Each stoker can be equipped easily with thermostat controls or all of the stokers on a kiln can be controlled by one instrument.

IV. Results Obtained

The results of the experiments with stokers for two months are as follows. It is possible to fire an 8-furnace kiln with 4 stokers. In case of a 10-furnace kiln, 6 stokers would be satisfactory. Whether 4 stokers or 8 stokers on a kiln are used, the total fuel consumption is constant for 1000 brick.

The amount of fuel used per 1000 brick was reduced from 750 pounds with hand firing to 580 pounds with stoker firing, a savings of 24.6%.

The savings on firing a round downdraft kiln by stoker can be accounted for by regular firing and by the great pressure that can be maintained within the kiln throughout the firing without sacrificing air volume as in case of hand firing with induced draft.

Cheaper fuel can be used in stokers than in regular firing. In this plant, the savings on the cost of fuel would be approximately $1.00 per ton; now 50 cents per ton. No labor was saved.

The quality of the product showed marked improvements; the courses on the outer edge of the kiln were more uniform in size and color and less flashed. Flashed ware, however, can be produced with stokers, as well as in hand firing. The time of firing was decreased approximately twelve hours.

Stokers are being used successfully on coal-fired tunnel kilns, and some have showed a saving in fuel as much as 14%. Merry Brothers Brick and Tile Company of Augusta, Georgia, has used a stoker on a continuous compartment kiln for two years and shows a saving in fuel of 8.6% more than by hand firing.

Isenhour Brick & Tile Company
Salisbury, North Carolina

EVAPORATING THE WATER WITH BURNING ALCOHOL AS A RAPID MEANS OF DETERMINING MOISTURE CONTENT OF SOILS AND OF MOLDING SANDS*

By George John Bouyoucos

Abstract

This rapid method of drying clays is based on the fact that water will dissolve in alcohol and that alcohol containing up to 45% water will burn and its water content evaporate. This method has proved to be accurate and rapid; the combined water is not influenced and the organic matter remains unaffected except in mucks and peats. The method and equipment are described and test data are reported.

I. Introduction

It will be generally admitted that a need exists for a rapid, dependable method to determine the moisture content of soils (especially under field conditions) and of molding sands.

II. Principle of New Method

The fact that alcohol is capable of extracting the moisture from soils,[1] that it burns, and that, upon burning, it also tends to evaporate the water dissolved in it, suggested the idea that the moisture content of soils might be determined by treating the soil with an excess of alcohol and then burning the alcohol.

The principle is to extract the soil moisture with alcohol and then, by burning the alcohol, to evaporate the water and at the same time dry the soil completely by the heat produced. By repeating the treatment and weighing the soil sample after each burning, complete drying is definitely assured. Methyl, ethyl, and propyl alcohols may be used. All three will ignite and burn when they contain as much as 40 to 45% water by volume, although not all the water in these dilutions is evaporated.

III. Procedure of Method

The following materials were used to determine the moisture in soils by evaporating it with burning alcohol: (1) a special metal cup, 2 inches in diameter by 1 inch in height, with perforated bottom, and standing on four narrow legs 1/4 inch high (Fig. 1);[2(a)] (2) a metal cup about 3 inches in diameter by 1 inch in height, with a solid metal bottom; (3) a pair of ordinary crucible tongs; (4) filter paper to fit the perforated bottom of cup (1); (5) a very high-grade triple-beam balance, sensitive to about 0.01 gram;[2(b)] and (6) methyl alcohol.

The procedure for making a moisture determination was first to lay a filter paper in the bottom of cup (1), to place this cup in cup (2), and to weigh them together. During the entire procedure the two cups were kept one inside the other and were weighed together as a single unit. A layer of soil about 1/2 inch thick, amounting to about 20 to 25 grams, was placed in cup (1), and the cups were weighed again. On the top of the soil layer about 25 cubic centimeters of methyl alcohol were then poured gradually and, after most of it had drained through the soil, it was ignited. After all the alcohol was burned and the flame went out, the cups were weighed. In order to be certain that all the water in the soil was expelled, 10 to 15 cubic centimeters of alcohol were poured into cup (2) and burned, and the cups were weighed again. This procedure of burning small quantities of alcohol in cup (2) and weighing the cups was repeated until the weight became constant. It was experimentally found that the moisture content of a soil can be determined more rapidly and with considerably less consumption of alcohol by adding a small amount of alcohol at a time than by adding a large amount at the outset.

To burn 15 cubic centimeters of pure methyl alcohol in cup (2) takes about 3 minutes. To evaporate 5 cubic centimeters of water in cup (2) requires 10 minutes and 30 cubic centimeters of alcohol, added in two 15-cubic centimeter portions. The time required to make a soil moisture determination by this method depends upon the amount of water present in the soil and upon the extent to which the alcohol extracts the water as

* Received December 17, 1937.

[1] (*a*) G. J. Bouyoucos, "The Alcohol Method for Determining Moisture Content of Soils," *Soil Sci.*, **32** [3] 173–78 (1931); *Ceram. Abs.*, **10** [12] 863 (1931).

(*b*) G. J. Bouyoucos, "The State in Which the Hygroscopic Moisture Exists in Soils as Indicated by Its Determination with Alcohol," *Soil Sci.*, **41** [6] 443–47 (1936); *Ceram. Abs.*, **15** [11] 346 (1936).

[2] (*a*) The special cup may be obtained from the Wood & Metal Products Co., Box 234, Bloomfield Hills, Mich.

(*b*) A high-grade triple-beam balance used in connection with this method is that represented in Catalog No. 1966 of Arthur Thomas & Co.

it percolates through the soil. It is quicker to evaporate the water when it is dissolved in alcohol than when it is in the soil. To determine the moisture content of soils that are easily permeable,

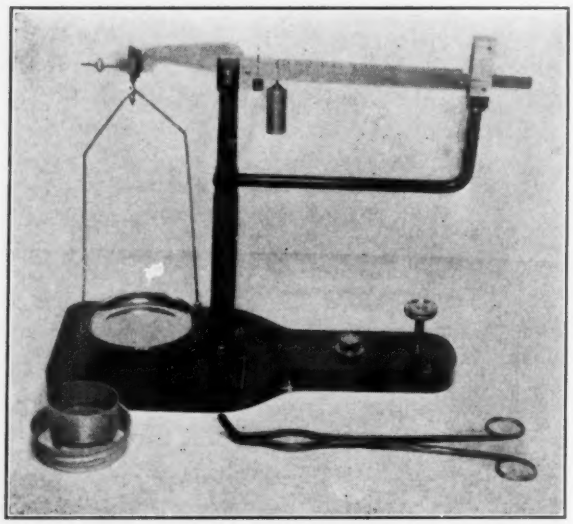


FIG. 1.—Apparatus for determining moisture content of soils by the alcohol-burning method.

such as sands or clays in the granular condition and of low moisture content, takes about 5 to 15 minutes including the time for weighing. Soils that have a high moisture content, especially if they are impermeable, such as heavy puddled clays, require from 10 to 35 minutes for a moisture determination. On the other hand, work may be carried forward on a number of soils at the same time, as the procedure does not require constant attention.

Toward the end of the drying, when all the water has been driven off, the soils attain a temperature of about 120°C near the center of the cup and about 150°C near the walls of the cup.

IV. Experimental

From fundamental considerations, it is reasonable to expect that the water in soils could be expelled by means of burning alcohol. The only question is whether the treatment is so drastic that it also burns the organic matter present and drives off the combined water from the mineral portion of the soil. In subjecting the method to a critical and comprehensive examination, therefore, many different soils with different organic matter and combined water contents were used.

In Table I is shown a comparison of the moisture content of these soils as obtained by the burning-alcohol method and by the standard oven method, wherein the soils were dried for 24 hours at a temperature of 110°C. In the same table, the percentage of organic matter and of combined water contained in many of these soils as determined by the distillation method[3] is shown. For the purpose of establishing the principles under consideration, soils in the air-dry condition were preferred. Soils in the air-dry condition permit a more accurate sampling than do wet soils, especially the sticky types. The wet soils studied were chiefly those taken from the field, and, wherever possible, they were passed through a 2-millimeter sieve and thoroughly mixed. In the puddled condition, they were thoroughly kneaded to obtain uniform water content.

The experimental data presented in Table I show that (*a*) the burning-alcohol method is as accurate for determining the moisture content of mineral soils as is the oven-drying method; the results by both methods agree remarkably close; (*b*) the combined water of the mineral soils investigated was not influenced by the alcohol-burning procedure; and (*c*) organic matter up to about 11% in mineral soils seemed to be unaffected by the burning alcohol. It is seen from these data that mineral soils containing up to about 11% organic matter give off as much water or suffer the same loss in weight with the burning-alcohol method as with the oven-drying method. It is only in mucks and peats and in mineral soils containing more than 11% organic matter, especially in an undecomposed state, that repeated burning of alcohol affects the organic matter by bringing about either decomposition or ignition.

V. Discussion

There is no question that the moisture content of mineral soils can be determined by partial extraction with alcohol followed by evaporation with burning alcohol. The procedure can be carried out rapidly. It can also be accurate, as the heating can be repeated until the weight becomes constant. The failure of the burning-alcohol procedure to affect the organic matter in mineral soils containing not more than about 11% may be explained by the fact that the soils are heated intermittently for only a few minutes,

[3] G. J. Bouyoucos, "The Distillation Method for Determining the Combined Water and Organic Matter in Soils," *Soil Sci.*, **36**, 471–83 (1933).

that the organic matter in these soils is so diluted by the mineral matter that no ignition takes place, and that, as the cup containing the soil does not stand high above the base, the soil is not subjected to the most intense heat of the flame and consequently the temperature of the soil mass does not go above 120° to 150°C. Unless ignition is induced at the surface which comes in contact with the flame, these temperatures are not high enough to cause much decomposition of organic matter, especially of the humus type,[4] neither are they high enough to break down the mineral portions of the soils and drive off the combined water.[5] On the other hand, these temperatures may be sufficiently high to expel the weakly held water of hydration of some materials. Normal propyl alcohol evaporates the water almost twice as rapidly as either methyl or ethyl, but it is more expensive.

This new rapid moisture method could be used in main laboratories and in field laboratories for determining moisture content of soils. It should be of particular value in phases of work in which it is desired to determine the moisture content immediately. It could also be used to dry materials, such as marls, for rapid analysis. Studies are under way to determine whether it could also be used as a practical field method.

TABLE I

COMPARISON BETWEEN THE ALCOHOL-BURNING AND THE STANDARD OVEN-DRYING METHODS FOR DETERMINING MOISTURE CONTENT OF SOILS

Soils	Depth (in.)	Moisture Content: Alcohol method (%)	Moisture Content: Oven method (%)	Combined water (%)	Organic matter (%)
Silica gel		0.68	0.70	4.37	0
Fuller's earth		8.49	8.35	9.53	0
Bentonite		12.61	12.68	4.88	0
Hagerstown clay loam	0–6	4.92	5.05	8.20	0
" " "	70–80	4.38	4.25	8.00	0
Irredel loam	12–16	5.60	5.38	8.31	0
Bladen "	12–18	3.10	3.31	5.30	0
Decatur clay	0–6	1.32	1.25	4.04	0
Davidson clay loam	24–30	2.20	2.18	8.46	0
Calcareous clay	C horizon	3.70	3.92	3.61	0
Susquehanna clay	2–6	3.75	3.98	4.48	0
Lufkin clay	10–16	10.11	10.43	5.90	0
Marion silt loam	Surface	1.95	2.03	2.94	2.44
Putnam " "	"	2.35	2.48	2.99	3.82
Grundy " "	"	2.81	2.76	4.10	2.56
Buchner silty clay	"	3.75	3.96	3.79	3.43
Colby silt loam	"	2.56	2.38	3.12	3.52
Houston clay	A horizon	7.00	7.20	7.21	8.87
Fargo clay adobe	Surface	8.18	7.80	6.18	5.82
Fargo clay loam	6–16	5.20	5.35	4.06	4.38
Yolo silt loam	1–18	4.38	4.20	5.27	4.65
Lake Clark's clay	Surface	4.55	4.35	3.27	2.34
Webster silty clay loam	"	4.68	4.46	4.32	8.84
McKenzie clay	0–1	5.35	5.09	3.92	2.82
" "	A horizon	7.53	7.28	5.29	4.43
Black clay adobe		5.25	5.42	7.79	0.80
Kerwin fine sandy loam	9–12	4.22	4.05	6.83	0.54
Stockton clay adobe	0–16	8.55	8.32	6.71	0.40
Clyde clay	Surface	6.40	6.35	5.20	10.32
Clyde soil		6.55	6.30	5.70	10.74
Organic mineral		8.9	5.89	4.98	12.18
Field soil No. 1		13.4	13.4		
Field soil No. 2		53.1	54.0		
Field soil No. 3		14.08	13.58		
Field soil No. 4		18.35	19.00		
Field soil No. 5		26.30	25.90		
Field soil No. 6		20.08	20.51		
Field soil No. 7		37.18	38.06		
Field soil No. 8		29.38	29.97		

VI. Summary

Partial extraction with alcohol followed by drying with burning alcohol is presented as a rapid

[4] G. J. Bouyoucos, "Method for Determining Degree of Decomposition That Unknown Decayed Vegetable Organic Materials Have Already Undergone in Nature," *Soil Sci.*, **38**, 477–82 (1934); see also footnote reference 3.

[5] L. Baver and G. M. Horner, "Water Content of Soil Colloids as Related to Their Chemical Composition," *ibid.*, **36**, 329–53 (1933); see also footnote reference 3.

and accurate method to determine the moisture content in soils.

The procedure consists of treating the soil with alcohol in a special apparatus and burning the alcohol, the heat from which evaporates the water and dries the soil completely.

This alcohol-burning process raises the temperature of the soil only to about 120° to 150°C. It has no influence on the combined water and no effect on organic matter up to about 11% in mineral soils. In mucks, peats, and in mineral soils containing more than about 11% organic matter, especially in the undecomposed state, the method is not applicable.

In mineral soils containing less than about 11% organic matter, the method is as accurate in determining moisture content as is the standard oven-drying method.

The method is rapid. The moisture content of sands can be determined by its use in 5 to 10 minutes, loams in 10 to 20 minutes, and clays in 10 to 35 minutes, depending on their content of water and their permeability to alcohol.

MICHIGAN AGRICULTURAL EXPERIMENT STATION
EAST LANSING, MICHIGAN

DRYING CHARACTERISTICS OF A CALCAREOUS SURFACE CLAY*

BY R. K. HURSH AND C. R. FILIPPI

ABSTRACT

The drying behavior of two samples of calcareous surface clay was observed under varied conditions of temperature and relative humidity. The results of drying tests on stiff-mud, side-cut, and end-cut brick are given.

I. Introduction

A series of drying tests were made with two samples of calcareous surface clay used for the manufacture of common brick. The effects on the drying behavior of different temperature and humidity conditions and of various rates of heating were observed. The drying of side-cut brick from one of the clays and of end-cut brick from the other was compared.

Preliminary tests to observe the general drying characteristics of the materials and the effects of temperature and humidity were made with cylindrical test pieces, 1 by 6 inches, formed by stiff-mud extrusion. Tests were made with full-size brick taken from the off-bearing belts at two plants to compare the results due to structure in end-cut and side-cut products and to determine the effects of different drying schedules.

The two clays differed slightly in their drying behavior and physical properties. The differences in physical properties are reported by Grim,[1] as follows:

> The material (17) is composed of the same mineral constituents (granite, green shale, brown shale, limestone, quartzite, sandstone, basalt, chert, quartz, mica, pyrite, etc.) in much the same grain-size grade distribution as the material (22). In other words, the sand fractions of both samples are composed of the same mineral constituents; the silt fractions of both samples are composed of the same mineral constituents, etc. There is, however, the following noteworthy difference: the material (17) contains more fine silt (grains about 0.02 mm. in diameter) and clay than the material (22). As the clay minerals are the most abundant relatively in the finest fractions, there is the further difference that the former sample contains slightly more clay mineral than the latter.

The material has been classified by Dr. Grim as a clay of the beidellite type.

Drying tests were made in a drying cabinet with automatic control of temperature and relative humidity, duplicate specimens being used in each test. Loss of weight was determined at intervals on specimens suspended from a balance placed above the drier. Uniformity of drying treatment on the various specimens in a test was insured by placing them in a limited section of the drier in which previous tests had shown a satisfactory uniformity of air velocity. In the tests of the full-size brick, only one specimen could be suspended from the balance. Weighings of the other brick in the test were made by removal from the drier at intervals. The results showed good uniformity in the water-loss determination on duplicate specimens, one being weighed suspended in the drier and the other removed for weighing. Linear shrinkage was determined at the time of

* Presented at the Thirty-Ninth Annual Meeting, American Ceramic Society, New York, N. Y., March 24, 1937 (Structural Clay Products Division). Received August 26, 1937.

[1] Private communication, R. E. Grim, petrographer, Illinois State Geological Survey.

weighing by measuring the distance between marks made on the specimens at the start of the test.

The temperature of the ware in tests with brick was determined by means of a thermometer inserted in the center section of the test brick. Temperatures were taken at two points in the surface,

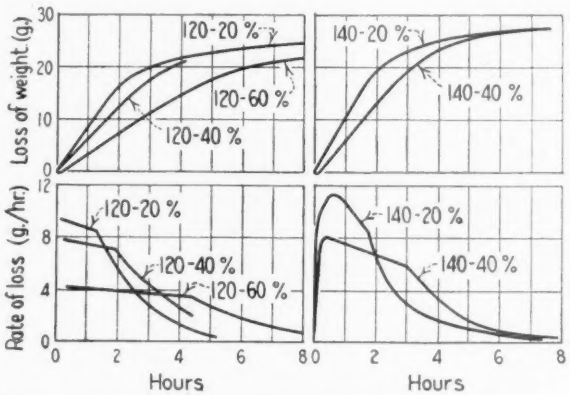


FIG. 1.—Drying clay cylinders at constant temperature and relative humidity.

but these showed a negligible difference or temperature gradient even with rapid rates of heating.

II. Preliminary Tests on Clay Cylinders

Drying tests of the clay cylinders were made with constant temperature, relative humidity, and air velocity maintained throughout the test. The drier was brought to the desired conditions before the specimens were introduced. In three separate tests at a temperature of 120°F, the relative humidity of the air was maintained at 20, 40, and 60%, respectively. The weight losses of the specimens at different time-intervals and the rates of weight loss are shown by curves in Fig. 1. Similar data for the results of tests at 140°F and 20 and 40% relative humidity are shown for comparison.

The effect of change in the relative humidity of the air is indicated in the differences in slope of the loss-of-weight curves for the tests at a given temperature. The curves are almost linear in the first part of the drying and the average rate is inversely proportional to the degree of relative humidity. More strictly speaking, the rate of evaporation in this period is directly proportional to the difference in the vapor pressure of the water in the ware and that of the surrounding air. The time required to remove a given amount of water from the clay is also inversely proportional to the relative humidity of the air in this stage of the drying.

A comparatively sharp break appears in the loss curve with a gradually decreasing slope to the completion of the drying. This break is most pronounced in the curves for lower values of relative humidity and occurs earlier and, possibly, at a higher moisture content of the ware than with slower drying.

An initial gain in moisture is shown in the curve for 60% relative humidity at 120°F and with 40% at 140°F. The clay specimens were at room temperature (about 70°) when they were placed in the drier; in this instance, they were at a lower temperature than the dew-point of the drier atmosphere, which caused condensation.

The drying procedure is better shown by the curves for rate of loss. These were obtained from determinations of the losses in successive short-time intervals. The values are subject to considerable error in the early stages of drying when rapid rates are used because of the small values of the loss in proportion to the total weight of the specimen and the short-time intervals required for satisfactory measurements. With slower drying, as shown by the curve for 60% relative humid-

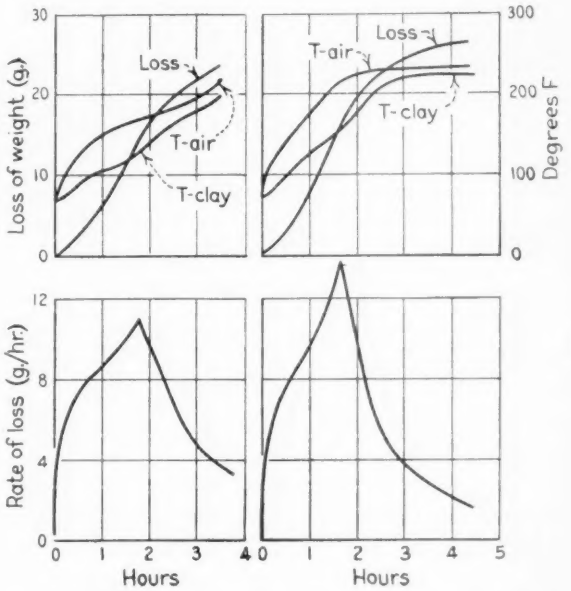


FIG. 2.—Effect of increasing temperature during drying of clay cylinders

ity, the loss takes place at a rapidly increasing rate as the specimen heats up. This is followed by a linearly decreasing rate of loss up to a critical point at which there is a sharp break in the curve

and a distinct change in its character. The slower the drying, the longer the time interval before this break occurs. The slope of the linear portion of the rate curve increases as the relative humidity of the air is decreased.

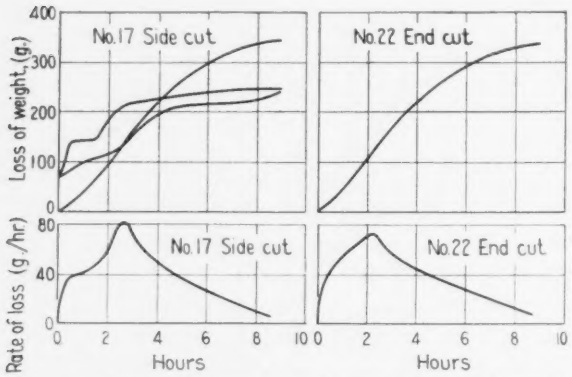


FIG. 3.—Drying end-cut and side-cut brick with rapid heating schedule.

An increase in the air temperature in the drier resulted in a greater slope in the loss curve and an increased rate of drying with the same degree of relative humidity, as indicated by comparison of the curves for 20% relative humidity at 120° and 140°F, respectively. This is due to the greater vapor-pressure difference between the water and the atmosphere at the higher temperature for the same values of relative humidity.

In these tests the specimens were dried safely at 120° in each case, but at 140° cracking occurred early in the drying, although the rate of water loss at the time when the cracks appeared was little if any higher than in tests at 120°, in which no cracking took place. The difference in rate did not seem to explain sufficiently the difference in behavior, and it seemed evident that the higher temperature and the faster heating of the specimen was the primary cause. It was evident that this material could not be safely introduced into an atmosphere much above 120°F.

Tests were made in which the drier temperature was the same as or only a few degrees above that of the ware when introduced; the drier was then heated at such rates that the ware temperature increased approximately 35° and 55° per hour. Corresponding to these rates, the air temperature in the drier reached 146° and 172°F, respectively, in the first hour. The maximum rate of water loss in the first of these tests exceeded that of any of the previous tests but was not reached so early in the drying operation. The total time required to complete the drying was much shorter and the ware dried without cracking.

The results from tests on small specimens showed the advantage of starting the drying treatment at atmospheric temperatures. Rapid rates of heating could be used safely. The high maximum rates of water loss from the ware, in general, were not attained until shrinkage was entirely or nearly completed.

III. Tests of Brick

The drying procedure for full-size brick was therefore based on this practice. Side-cut and end-cut brick were dried simultaneously for comparison of their behavior. The temperature of the brick was measured and linear shrinkage was determined as the drying proceeded.

In Fig. 3 are shown results of drying the brick in an atmosphere of 20% relative humidity. The temperature was raised rapidly to 140°F and held at this point until measurable shrinkage ended in $1^1/_2$ hours. The temperature was increased 60° in the next hour and then gradually to a maximum of 245°. The temperature of the brick increased gradually but showed a distinct lag, owing to the high rate of evaporation during two hours of drying.

Some difference in the drying behavior of the end-cut and side-cut brick is indicated by the curves for rate of water loss, but the significance is doubtful since the exact determination of rates in the early stages of drying is extremely difficult. The end-cut brick show a somewhat higher maximum rate of water loss, which might be expected. The latter stage of drying or the falling-rate period is practically identical for the two types of brick.

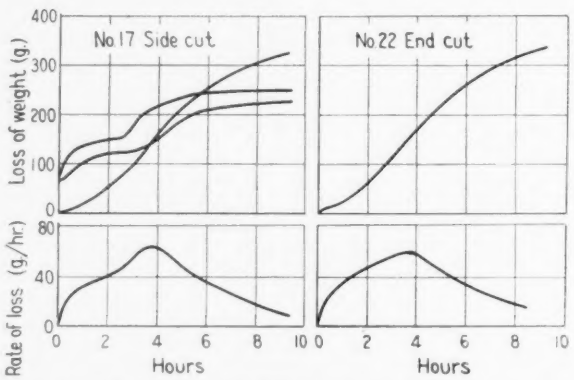


FIG. 4.—Drying end-cut and side-cut brick with slower heating rate.

Some cracks developed longitudinally in the

end-cut brick in this test during the shrinkage period. While these were due primarily to the laminated structure, the drying schedule was considered somewhat too severe.

A relative humidity of 40% and a somewhat slower heating schedule were used in the test shown in Fig. 4. The rate of water loss increased more slowly and a somewhat lower maximum was reached. The time required to reach the maximum rate of loss was about one-third longer than in the test shown in Fig. 3, and the rate of shrinkage was correspondingly decreased. The rate curves for the two types of brick are more nearly alike and there is only a slight difference in the maximum rates attained. The time required for complete drying was only about 10% longer than in the test with lower relative humidity and faster heating rate. The slower schedule decreased the strains in the shrinkage period sufficiently to eliminate cracking.

IV. Discussion of Results

There seems to be a critical initial temperature for drying these materials. If this is exceeded, cracking results even with sufficient increase in relative humidity to maintain a rate of water loss equal to that at lower drying temperatures. At the higher temperatures, the cracking occurs early in the drying, the effect being like that of thermal shock.

For safe drying of such materials at a maximum rate, it seems desirable to start from normal atmospheric temperatures rather than to introduce the clay body into air at an appreciably higher temperature. Rapid heating rates at comparatively low relative humidity and with high rates of evaporation can be safely applied when the drying starts from atmospheric temperature.

The "so-called" humidity treatment would not be as satisfactory for this clay or ware as the gradual heating with lower humidity and progressive increase in rate of water loss during the shrinkage period.

The drying schedules used in these tests with single brick specimens would obviously not be directly applicable in the ordinary commercial drier in which large masses of brick are closely hacked on cars. It is impossible to maintain uniformity of conditions and treatment in such large masses. The general principles of drying, however, can be applied to advantage with a modification in heating rates and the maintenance of a positive air circulation through the ware on the drier car.

Department of Ceramic Engineering
University of Illinois
Urbana, Illinois

FURTHER STUDY OF WATER PENETRABILITY OF CLAY AND SHALE BUILDING BRICK*

By J. W. McBurney and A. R. Eberle

Abstract

The rapidity of water absorption (penetrability) and water-absorptive capacity of approximately 1600 clay or shale brick were determined. The samples were taken from a wide range of geographical locations and consisted of soft-mud, dry-press, and both side-cut and end-cut stiff-mud brick. One recent specification of general interest required that the 3-minute partial immersion absorption (penetrability) shall not be less than 1, nor more than 4, ounces per brick. Fifty per cent of the brick tested fell within these limits.

I. Introduction

Penetrability, quoting Washburn[1] "may be qualitatively defined as the ease with which a liquid is drawn into the pores of a body by capillary action, without attendant chemical action between the body and the liquid." The term "penetrability" in this paper refers in general to the same phenomenon which is called rate of absorption in the papers by Palmer,[2] Palmer and Parsons,[3] and Voss.[4]

The following methods of test and measures for penetrability were tested:

(*a*) Washburn[1] proposed a method which measured "the amount of a standard liquid which, in a stated time, a standard test piece will absorb, at a stated temperature, when a stated surface of the piece in a determined position (horizontal or vertical and, if horizontal, then a lower, not an upper, surface) is kept in contact with the liquid, and the air surrounding the test piece is kept saturated."

(*b*) Palmer[2] modified Washburn's method by determining gain in weight for a series of successive time intervals when the lower surface of the brick was in contact with water. Palmer and Parsons[4] proposed an equation relating gain in weight and time for any particular brick.

(*c*) McBurney[5] proposed, as a measure of penetrability, the length of time required for water to rise through a brick and wet the upper surface when the lower surface of the previously dried brick was in contact with water.

(*d*) McBurney[5] also described a method of determining penetrability by measuring the time required for 1 milliliter of water to be absorbed by an upper horizontal surface 5 square centimeters in area.

These methods have in common their concern with that portion of the time-absorption curve where water is entering the brick at a rapid rate in comparison with the slow rate of increase of absorption which follows a long-time partial or total immersion of the test piece. Penetrability tests may be regarded as measures of the speed with which water enters a brick. On the other hand, absorption tests (total immersion for not less than 5 hours determined according to present standard methods[6]) measure capacity of the brick for water. This distinction was recognized by Washburn in 1921,[1] but it was not until publication of Palmer and Parson's findings[3] on the effect of water penetrability of the brick unit on bond between brick and mortar that interest became widespread. A penetrability test for brick was included in the 1935 specification of the Housing Division of the Public Works Administration.

The present paper presents and compares the results of tests on approximately 1600 clay and shale building brick by the following methods: (1) penetrability by partial immersion in water for 1 minute; (2) penetrability by partial immersion

* Received January 19, 1938. Publication approved by the Director of the National Bureau of Standards of the U. S. Department of Commerce.

[1] E. W. Washburn, "Porosity and the Mechanism of Absorption," *Jour. Amer. Ceram. Soc.*, **4**, 920 (1921).

[2] L. A. Palmer, "Some Absorption Properties of Clay Brick," *Bur. Stand. Jour. Research*, **3** [1] 105–27 (1929); R. P. 88; *Ceram. Abs.*, **8** [10] 734 (1929).

[3] L. A. Palmer and D. A. Parsons, "Study of Properties of Mortars and Brick and Their Relation to Bond," *Bur. Stand. Jour. Research*, **12**, 610 (1934); R. P. 683; *Ceram. Abs.*, **13** [8] 209 (1934).

[4] W. C. Voss, "Permeability of Brick Masonry Walls, a Hypothesis," *Proc. A.S.T.M.*, **33** [Part II] 670 (1933); *Ceram. Abs.*, **13** [4] 88 (1934).

[5] J. W. McBurney, "Water Absorption and Penetrability of Brick," *Proc. A.S.T.M.*, **29** [Part II] 712 (1929); *Ceram. Abs.*, **8** [10] 735 (1929).

[6] "Standard Methods for Testing Brick (Modulus of Rupture, Compressive Strength, Absorption) (C 67–37)," *Proc. A.S.T.M.*, **36** [Part I] 780 (1936); see also 1937 Suppl. to Book of A.S.T.M. Standards, p. 78.

in water for 3 minutes; (3) penetrability by time necessary for complete absorption of 1 milliliter of water on a horizontal surface of 5 square centimeters; (4) water absorption by 5-hour total immersion at room temperature; (5) water absorption by 48-hour total immersion at room temperature; and (6) water absorption by 5-hour total immersion in boiling water.

The results of the penetrability test by 3-minute partial immersion are classified according to raw material (clay and shale), method of forming (soft-mud, dry-press, side-cut, and end-cut), and by geographical districts.

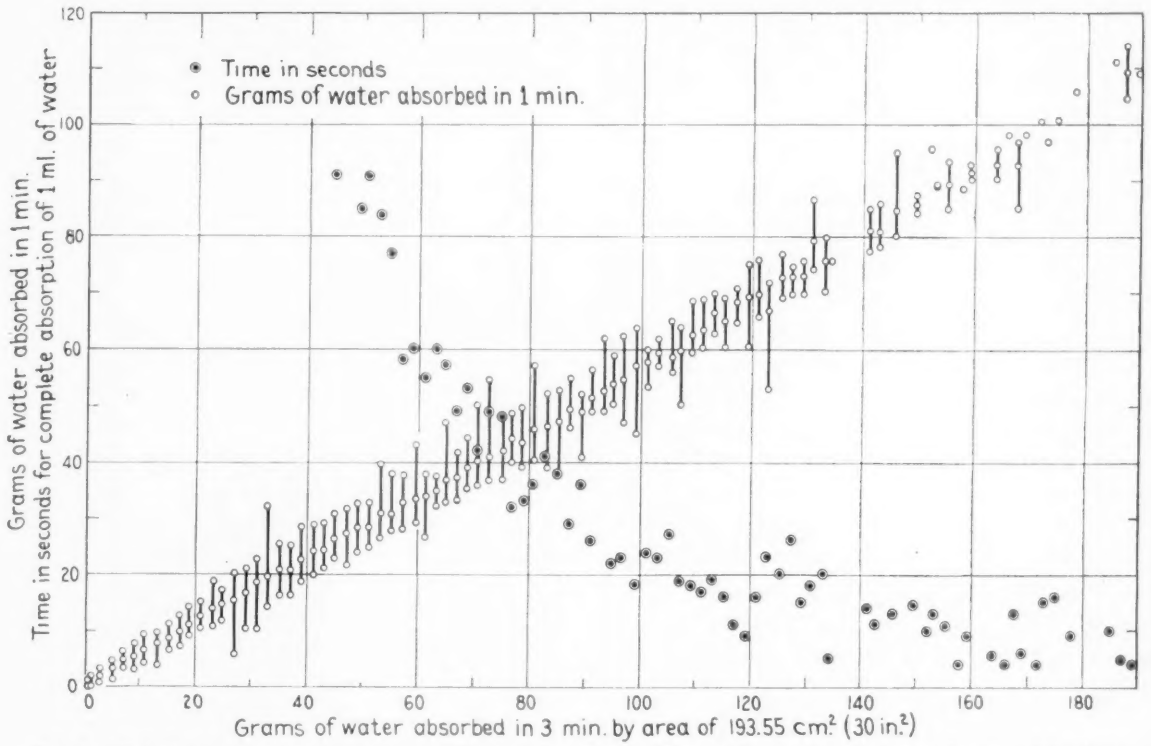


FIG. 1.—Relation between average penetrability measured by gain in weight resulting from 1-minute and 3-minute partial immersion in water and the relation between average time for complete absorption of 1 milliliter of water on 5 square centimeters of brick surface and gain in weight by 3-minute partial immersion.

II. Source of Samples

In 1929 the National Bureau of Standards, in coöperation with the Brick Manufacturers Association of America, collected 684 samples of brick from 255 manufacturers as part of a survey of the properties of building brick produced in the United States. These samples comprised a total of 3886 brick. The laboratory work originally included determinations of tendency to effluoresce, compressive strength, modulus of rupture, and water absorption by 5- and 48-hour cold immersion and by 5-hour boiling. Freezing and thawing tests were made on about 500 of the more underfired brick. A random sampling of the residue of the brick gave approximately 1600 specimens, and these results are reported in this paper. The removal of the underfired brick from the original sample produced relatively little change in the residue for a particular district because most of the underfired brick were typical of the district from which they came. It is considered that these 1600 brick represent reasonably well the original 3886 brick which constituted the 1929 survey sample. The reader is referred to the paper by McBurney and Lovewell[7] for a description of the survey which provided these samples and for a discussion of the survey's limitations.

III. Methods of Test

Each whole brick had been previously broken

[7] J. W. McBurney and C. E. Lovewell, "Strength, Water Absorption, and Weather Resistance of Building Brick Produced in the United States," *Proc. A.S.T.M.*, **33** [Part II] 638 (1933); *Ceram. Abs.*, **13** [4] 88 (1934).

transversely, and compressive strength was determined on one of the halves. Water absorption by 5-hour cold immersion, 48-hour cold immersion, and 5-hour boiling had been determined on the other half. These half brick, after two years' storage, had been washed in cold water, dried in a gas-fired oven, cooled, and tested.

On the flat of the half brick, a circle 2.5 centimeters (1 inch) in diameter was drawn with a pencil. From a pipette, discharging in not more than 2 seconds, 1 milliliter of water was applied to the approximately 5 square centimeters of area bounded by the circle. By observing the moment of extinction of specular reflection from the water surface, the time for complete absorption may be determined quite sharply. The test was terminated if absorption was incomplete at the end of 300 seconds.

After completion of this test, the half brick was weighed without redrying and set flatwise in $^1/_8$ inch of water, occupying the same position as in the previous test. At the end of one minute, the specimen was removed from the water, wiped with a damp cloth, and reweighed. The same surface of the half brick was then given an additional 2-minute contact with water by the same method and again weighed. Comparisons of the gain in weight resulting from continuous partial immersion for 3 minutes with the total gain in weight resulting from two partial immersions totalling 3 minutes showed that the two tests were in agreement within the reproducibility of repeated tests by either method. The area of the flat of the half brick was measured, and the corresponding gain in weight for a standard size whole brick (flat of 30 sq. in.) was calculated. Such a calculation is permissible when the brick has a uniform cross-section.

IV. Presentation and Discussion of Data

(1) Comparison of Penetrability Tests

Figure 1 shows the relation between the 1- and the 3-minute partial immersion absorptions in grams and also the relation between the time for complete absorption of 1 milliliter and the 3-minute partial immersion absorption. Figure 1 was constructed as follows: The data for gain in weight after 3-minute partial immersion were sorted into groups so that each group covered a range of 2 grams, *e.g.*, 0.0 to 2.0, 2.1 to 4.0 grams, etc. The average gain in weight by 3-minute partial immersion was calculated for each group, and the corresponding average of the gain in weight by 1-minute partial immersion of the same brick was also determined. These two averages fixed the central points located on the short vertical lines shown in Fig. 1. The vertical lines connect the maximum and minimum gains in weight by 1-minute partial immersion, which were measured on the brick whose 3-minute gains in weight were in the same group.

If the results of the corresponding calculation (classification by 1-minute partial immersion and location of averages, maximum and minimum of the associated 3-minute gains in weight) had been entered in Fig. 1, the resulting averages would fall equally well on the same straight line. The horizontal lines which would be drawn to connect the maximum and minimum 3-minute gains would average about the same length as the vertical lines shown.

The average gain in weight by 1-minute partial immersion is 58% of the average gain in weight by the 3-minute partial immersion, according to these data. If the rate of absorption is such that water has risen to the upper surface in three minutes or less, then the proportionality factor in the relation increases and approaches 100 as the time for "striking through" approaches one minute.

The average time for complete absorption of 1 milliliter by a surface of 5 square centimeters was calculated for each group of specimens previously classified by gain in weight after 3-minute partial immersion. Those groups in which the 3-minute absorption was less than 44 grams contained one or more specimens for which the time of absorption of 1 milliliter was not determined, this time exceeding 300 seconds. Because of this time uncertainty of one or more specimens in the group, an exact average time value for the group could not be determined, and therefore no value has been given for such groups. The actual time for complete absorption is not known in such cases. One brick, which had a 3-minute gain in weight of 5 grams by partial immersion, had not completely absorbed 1 milliliter of water at the end of $2^1/_2$ hours.

The maximum and minimum values are not given for the absorption time of 1 milliliter (Fig. 1). In general, the range in the 1-milliliter absorption becomes less as the 3-minute absorption (of the group) increases.

The hyperbolic form of the average relation between time for complete absorption of 1 milli-

liter and gain in weight by partial immersion for 3 minutes is explained by the following consideration:

Let a be the quantity of water (1 ml.) to be absorbed. Let x be the volume of water which is being absorbed per unit of area per unit of time. It would seem a reasonable assumption to consider that x is directly proportional to "gain in weight by partial immersion for three minutes," since three minutes is a definite time interval, the flat of the brick (30 sq. in.) is a definite area and weight, and with volume of water each is interchangeable in this equation. With this assumption, y (time for complete absorption of volume a (1 ml.)) equals a/x. The equation, $y = a/x$, is the equation of an equilateral hyperbola.

Obviously the 1-minute and 3-minute gains in weight by partial immersion measure the same property or combination of properties of the brick, and there is little choice between the two tests. Within experimental error, one absorption can be calculated from the other.

A fair correlation exists between rate of absorption by partial immersion and rate of absorption by time for complete absorption of 1 milliliter when averages are considered. When brick, formed by different methods and from different raw materials, however, are compared by these two methods, quite different ratings may result. Quoting from an earlier paper,[5] "When . . . . . there is a decided discrepancy between the volume-time rate of penetration (partial immersion) and the height-time rate, this method (time for complete absorption of 1 ml.) follows the height-time rating." The "height-time" rate of penetration referred to in this quotation is method (*c*) listed in the Introduction. The opinion was rendered in 1929[5] "that this method (time for complete absorption of 1 ml.), owing to variation in surface conditions of the specimens, is essentially qualitative; it serves, however, to grade the samples into several classes. . . . ." A grading, based on time in seconds, is tentatively suggested as follows: (1) less than 20 seconds, (2) not less than 20 or more than 60 seconds, (3) not less than 60 or more than 300 seconds, and (4) more than 300 seconds.

Until more information is available on the effect of rate of absorption on bond strength and on water permeability of brick-mortar combinations, such a classification is of uncertain value. From observation and experience, a classification of building brick can be made as follows: (1) brick which require wetting before laying, (2) brick which can be laid dry, but give better results when laid wet, (3) brick which give satisfactory results when laid dry, but can be laid wet, and (4) brick which are so dense and impermeable that wetting causes "floating" or "drowning" of the mortar. This grading by "time for complete absorption of 1 milliliter" effects roughly a separation into these four types of brick.

(2) Relation between Water Absorption and Penetrability by Partial Immersion

Figure 2 shows the relation between water absorption by 5-hour total immersion at room temperature, 48-hour total immersion at room temperature, 5-hour total immersion in boiling water, and gain in weight by 3-minute partial immersion. As in Fig. 1, the gains in weight by partial immersion were classified into groups by 2-gram differences, and the averages were determined for the water absorption of all brick falling in each group. The average relation between water absorption and gain in weight up to 44 grams in 3 minutes is rather regular.

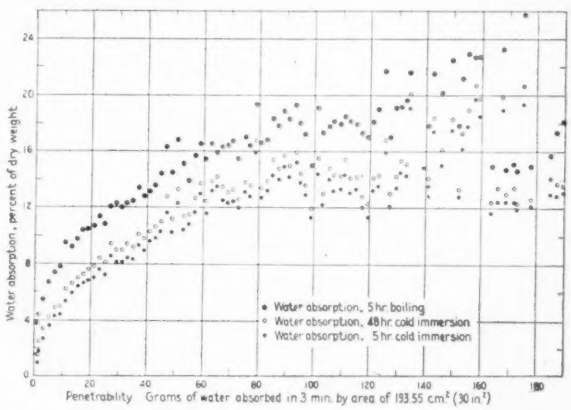

Water absorption, percent of dry weight
Penetrability Grams of water absorbed in 3 min. by area of 193.55 cm² (30 in²)
Water absorption, 5 hr. boiling
Water absorption, 48 hr. cold immersion
Water absorption, 5 hr. cold immersion

FIG. 2.—Relation between penetrability (gain in weight by partial immersion in water for 3 minutes) and water absorption by total immersion.

The relation between average water absorption and gain in weight by partial immersion becomes increasingly erratic as gain in weight increases. Had the result on individual brick been plotted or had maximum and minimum values been entered, the lack of correlation between water absorption and rate of absorption by this method would have

been still more evident. The averages used in the construction of Fig. 2 include results on dry-press, soft-mud, side-cut, and end-cut brick made from clay, shale, fire clay, and mixtures thereof. Correlation between water absorption and rate of absorption is much improved if the brick under consideration are confined to one method of forming and one raw material.

(3) Effect of Raw Materials and Methods of Forming Brick on Penetrability as Measured by Gain in Weight by Three-Minute Partial Immersion

Table I compares the 3-minute absorption of brick made with different materials and also compares the absorptions of brick made by the several methods of forming.

The distribution shown for "all brick tested" (Table I) correlates well with the distribution for water absorption by 5-hour immersion given in Table III of the paper by McBurney and Lovewell.[7] In comparing these two distributions, it should be remembered that the range 0 to 14 grams gain in weight by partial immersion for 3 minutes corresponds to a 0 to 6.0% gain in weight by cold immersion for 5 hours (see Fig. 2).

Shale brick, compared with clay brick, show (1) a more restricted range in penetrability and (2) a more frequent occurrence of low penetrabilities. (Reference is made to Table VI of McBurney and Lovewell's paper[7] for the corresponding comparison of water-absorption data for clay and shale brick.) The elimination of certain underfired, dry-press shale brick occurring among these specimens would have accentuated the difference between clay and shale brick. The typical hard-fired, side-cut shale brick manufactured in West Virginia, western Pennsylvania, Ohio, Indiana, Illinois, and Missouri, almost without exception, are in the 0.0- to 1.0-ounce range.

The apparent effect of method of forming on penetrability of brick is, in part, caused by differences in raw materials and in part by peculiarities in the distribution of the samples. All soft-mud brick tested were made from clay. Clays and shales were about equally represented in the dry-press and side-cut brick, and all of the end-cut brick were clay, the majority from Chicago and Philadelphia.

From tests on brick from the same raw material and subjected to the same firing conditions but formed by different methods, it is concluded that, except for the use of the dry-press process, the method of forming has little effect on penetrability. Dry-press brick have notably greater penetrabilities when compared with brick of equal degree of firing but formed by other methods.

TABLE I

EFFECT OF RAW MATERIAL AND METHOD OF FORMING BRICK ON GAINS IN WEIGHT RESULTING FROM 3-MINUTE PARTIAL IMMERSION IN WATER

Gain in weight		All brick tested (% of total within range)	Brick classified by raw material (% within range)		Brick classified by method of forming (% within range)			
Range (grams)	Range (ounces)		Clay	Shale	Soft mud	Dry press	Side cut	End cut
0–14.0	0–0.5	27.0	23.8	38.4	27.8		35.1	7.7
14.1–28.0	0.5–1.0	14.6	12.4	19.6	10.0	1.2	19.6	22.6
28.1–42.0	1.0–1.5	12.2	10.4	14.7	7.4	3.5	15.5	24.4
42.1–56.0	1.5–2.0	9.6	11.1	4.4	9.8	7.0	6.3	22.6
56.1–70.0	2.0–2.5	9.0	10.0	6.7	10.9	15.1	6.0	9.5
70.1–84.0	2.5–3.0	8.7	10.6	3.8	12.3	18.6	3.9	6.6
84.1–98.0	3.0–3.5	6.8	8.3	3.5	10.5	19.8	2.2	1.8
98.1–112.0	3.5–4.0	4.1	4.6	2.9	4.8	11.6	2.7	2.4
112.1–126.0	4.0–4.5	2.8	3.2	1.5	2.8	3.5	2.9	1.8
126.1–140.0	4.5–4.9	1.6	2.0	0.6	1.8	1.2	1.9	
140.1–154.0	5.0–5.4	1.0	1.0	1.2	1.1	4.6	0.3	0.6
154.1–168.0	5.4–5.9	1.0	0.9	1.5	0.6	4.6	1.3	
168.1–182.0	5.9–6.4	0.3	0.3	0.6	0.1	4.6		
182.1–196.0	6.4–6.9	0.6	0.5	0.6	0.1	3.5	0.8	
196.1–210.0	6.9–7.4	0.1	0.1			1.2		
210.1–224.0	7.4–7.9	0.4	0.5				1.0	
224.1–238.0	7.9–8.4	0.1	0.2				0.3	
238.1–252.0	8.4–8.9	0.1	0.1				0.2	
Number of brick equalling 100%		1581	1121*	341*	708	86	619	168

* Fireclay brick and brick made from mixtures of clay and shale included under "all specimens" are not included in this classification.

(4) Differences in Penetrability of Brick from Various Producing Districts in the United States

Because penetrability is affected by raw material, method of forming, and degree of firing, as are strength and water absorption, characteristic differences would be expected in the distribution of penetrability values when random samples representing different localities are compared.

The classification by producing districts follows rather closely that used by McBurney and Lovewell.[7] The reader is referred to Tables I and II of that paper for the following information: (1) the raw materials and methods of forming characterizing these districts, (2) the average strength and water absorption of brick from these districts, and (3) how well the sampling used in the present investigation represents the more complete sampling reported in the earlier paper.

As was noted in the 1933 paper,[7] some of these districts were inadequately sampled in the original survey. It was stated, "That portion of the United States situated between the Mississippi River and the Rocky Mountains as well as several sections of the South are poorly represented..... However, the reasonableness of the survey would appear to be somewhat established (1) on account of the consistency and resemblance of samples from different plants in the same district and (2) by the very wide range in properties represented, considering the survey as a whole." Knowing the strength and absorption properties of the original survey samples and the corresponding properties of the present partial samples, it can be stated that the present partial samples are as typical of the districts which they represent as were the original large samples. Inasmuch as the geographical limits of the districts (with some exceptions) were set so as to include only brick of like nature, it is believed the reduction in the number of plants represented from 225 to 122 does not significantly affect the representativeness of the sample.

TABLE II

PERCENTAGE DISTRIBUTION OF BUILDING BRICK ACCORDING TO GAIN IN WEIGHT IN OUNCES* FOR PARTIAL IMMERSION FOR 3 MINUTES IN WATER FOR VARIOUS PRODUCING DISTRICTS IN THE UNITED STATES

District	Number of plants represented	Number of samples represented	Number of specimens tested (100%)	Per cent of specimens with gain of weight						
				Less than 1/2 oz.	1/2–1 oz.	1–2 oz.	2–3 oz.	3–4 oz.	Greater than 4 oz.	Av. (oz.)
Me., N. H., and Vt.	7	20	125	43	16	17	13	9	2	1.15
Boston, Mass.	3	9	51	61	12	25	2			0.59
Mass. (except Boston)	6	14	69	46	12	10	4	15	13	1.53
Conn.	5	21	105	23	19	13	32	5	8	1.72
Hudson Valley	8	13	102	8	2	13	36	37	4	2.59
N. J.	4	12	68	12	21	40	21	6		1.52
Md.	3	8	40	32	23	37	8			0.91
Philadelphia	7	16	75	8	5	46	28	4	9	2.02
Eastern Pa. (except Philadelphia)	5	13	65	25	9	28	31		7	1.60
Western Pa. (including Pittsburgh and W. Va.)	6	13	73	45	42	12				0.60
Northern Ohio (including Cleveland)	6	18	78	58	13	12	10	6	1	0.89
Detroit, Mich.	5	8	35	29		6	49	17		1.95
Ky. and Ind.	6	9	59	30	19	10	14	25	2	1.64
Chicago, Ill.	3	3	38	3	8	50	29	11		1.93
Ill. and Mo. (except Chicago)	7	12	66	65	17	17	1			0.66
Wis.	4	15	61	23	5	18	23	16	15	2.21
Neb.	4	11	53	23	23	26	11	11	6	1.56
Colo.	3	8	33	21	6	33	3	12	25	2.15
Calif.	2	3	25				28	20	52	3.67
Texas	7	11	90	7	27	20	31	15		1.79
Ark., La., and Miss.	4	12	74	13	13	18	7	11	38	3.34
Ala., Tenn., and N. C.	10	21	114	23	13	30	9	12	13	1.94
Va. and District of Columbia	7	15	95	7	16	27	20	19	11	2.19
Total and averages	122	285	1594	26.5	14.9	21.7	18.0	11.2	7.7	1.62

* The use of "ounces" as the unit of gain in weight by partial immersion permits a direct comparison with the corresponding requirement of the 1935 building brick specification of the Housing Division of the Public Works Administration.

V. Summary and Conclusions

Water absorption by 5-hour and 48-hour cold immersion and by 5-hour boiling had been pre-

viously determined on 3886 brick. These included a wide range in properties and represented the principal raw materials and methods of forming. Penetrabilities have now been determined on approximately 1600 of the same brick by gains in weight resulting from 1-minute and 3-minute partial immersions in water at room temperature and by measuring the time for complete absorption of 1 milliliter of water on a surface of 5 square centimeters. Comparisons of these data are presented graphically, and the 3-minute partial immersion results are analyzed on the basis of raw material, method of forming, and source of the samples (geographical districts).

From these data, the following conclusions are considered to be justified:

(1) The relation between gain in weight by 1-minute and 3-minute partial immersion in water is linear for brick which do not wet through in 3 minutes under the conditions of this test.

(2) The average gain in weight by 1-minute partial immersion is 58% of the average gain in weight by 3-minute partial immersion, according to these data.

(3) If average gain in weight by 3-minute partial immersion in water be plotted against time for complete absorption of 1 milliliter of water on a surface of 5 square centimeters, the points group themselves roughly about an equilateral hyperbola. It may be seen from the figure that brick whose 3-minute absorptions are less than 45 grams require time longer than about 90 seconds for complete absorption of 1 milliliter of water, and brick with large gains in weight by partial immersion, *i.e.*, over 140 grams, will not require more than 15 seconds for the 1-milliliter absorption.

(4) Considering all raw materials and methods of forming, the relation between the average gain in weight by partial immersion in water for 3 minutes and average water absorption (total immersion at room temperature for 5 hours or 48 hours or by boiling for 5 hours) is fairly regular up to 44 grams (approximately 1.5 ounces) gain in weight by partial immersion for 3 minutes. The relation becomes increasingly erratic as the gain in weight by 3-minute partial immersion increases.

(5) Fifty-eight per cent of the shale brick had gains in weight by 3-minute partial immersion of less than one ounce; the corresponding figure for the clay brick was 36%. The range, 1 to 4 ounces, included 36% of the shale brick and 55% of the clay brick.

(6) Brick formed by the dry-press process have notably greater penetrabilities than those formed by the soft-mud, stiff-mud side-cut, or stiff-mud end-cut processes.

(7) In 12 of 23 districts only did 50% or more of the specimens fall within the limits of 1 to 4 ounces gain in weight by partial immersion in water for 3 minutes. Three districts (Hudson Valley, Philadelphia, and Chicago) provided specimens of which more than 75% fell within this limit.

National Bureau of Standards
Washington, D. C.

CELO KYANITE
UNIFORM QUALITY DEPENDABLE SUPPLY
FOR INFORMATION AND SAMPLES WRITE TO
CELO MINES, INCORPORATED
BURNSVILLE, NORTH CAROLINA

COMMUNICATIONS—CERAMIC HISTORY

MARY LOUISE McLAUGHLIN

Originator of Plastic Slip Underglaze Painting and Maker of One-Fire Porcelain Artware

Born in 1847, over ninety years ago; fourscore and ten, yet Miss McLaughlin is now writing a book. The sketch in Who's Who in America reads as follows:

"McLaughlin, Mary Louise, artist: b. Cincinnati: d. William and Mary (Robinson) M.; unmarried. Began making porcelain called Losanti ware, 1898; exhibited first in Paris Expn., 1900; silver medal for decorative metal work, Paris Expn., 1889; hon. mention for china painting, Chicago Expn.; gold medal, Atlanta; silver medal, Nashville Expn.; bronze medal for Am. porcelain, Buffalo Expn., 1901. Clubs: Cincinnati Woman's (hon. mem.), Woman's Art. Author: China Painting; Pottery Decoration; Suggestions to China Painters; Painting in Oil; The Second Madame; An Epitome of History, 1923."

What an inadequate, prosy sketch of one who in her late twenties and early thirties, without pottery experience, information, or guidance, visioned how to produce the underglaze faience painting with colored plastic slip practiced by Haviland. She proceeded without experimentation and produced a vase that is now in the Philadelphia Museum.

Having developed her underglaze faience successfully and, for her purposes, completely, she made porcelain. Again she had to rely exclusively on her own ingenuity. She had no one like Taxile Doat to train her in materials, mixtures, and processes. She had not seen Alexander Brongniart's treatise on coloring and decoration in the original German, but she had finished ware at expositions before Brongniart's treatise was available in English. In a few months she mastered the art of making porcelain herself, doing all of the work including the kiln firing. This was indeed a remarkable achievement.

Being at this time past fifty years of age, she "retired." There was no incentive to go on: she had already accomplished the end she sought.

Remarkable? Yes. It is inconceivable how she accomplished so much, having had so little information and no instruction. Starting from scratch, she made a record seldom equalled; two years from the beginning of her experiments she was exhibiting in the Paris Exposition and elsewhere.

In this issue of *The Bulletin*, Mary Louise McLaughlin is honored. We also honor Miss Clara Chipman Newton. Miss Newton was a close and enduring friend of Miss McLaughlin. She and the reporters quoted tell the story of those early days most authentically.

The references consulted are as follows:

(1) *Cincinnati Enquirer*, February 20, 1878.
(2) *Ibid.*, Oct. 20, 1878, "Cincinnati Faience—An Exact Statement As to Its Discovery."
(3) *Ibid.*, Nov. 7, 1878, "Miss McLaughlin's Art Discovery."
(4) *Cincinnati Times*, Nov. 29, 1878, "Miss McLaughlin's Triumph."
(5) *Boston Advertiser*, April 4, 1879, "Miss McLaughlin's Work in Decorating Pottery."
(6) *Cincinnati Daily Gazette*, Oct. 7, 1880, "War Among Potters, T. J. Wheatley Secures a Patent on American Limoges."
(7) *The Pilgrim*, 1905.
(8) *Chicago Record-Herald*, 1901.
(9) Edwin Atlee Barber, "The Pottery and Porcelain of the United States," p. 275, 1923.
(10) *Harper's Magazine*, May, 1881.

MISS McLAUGHLIN TELLS HER OWN STORY*

While most deeply sensible of the compliment you have paid me in asking for a record of my work in ceramics and other branches of decorative art, I must confess that it was with considerable reluctance that the task was undertaken. In fact, I shrank from turning the searchlight of memory over a course which must seem to others so erratic and which, from my own point of view, falls so far short of my ideals.

My earliest recollections are of drawing and the desire to cover every available surface with my efforts. In those days, however, the art was not considered a necessary part of the school curriculum, so it was not until after my school days were over that I sought instruction in drawing at a small private art academy on East Fourth Street, Cincinnati. This school was presided over by a lady whose artistic ideas and methods were decidedly early Victorian. After some time pleasantly but most unprofitably spent at this school, I went to the Art School then held in the College Building and graduated therefrom without honors, except the winning of one or two prizes, one for sculpture in 1876 and a prize for an original design, the first of the kind, I believe, ever offered, which consisted of a small piece of *niello* work given for the purpose by Mr. Probasco. Later I had the privilege of attending, for a short time, the first life class taught in Cincinnati by Mr. Duvenick at the Museum and have always felt that he was the only teacher who had any influence on my artistic development.

* Read at the Meeting of the Porcelain League, April 25, 1914, by Mary Louise McLaughlin. From Cincinnati Artists File, Cincinnati Art Museum Library.

We were, in fact, at this time, upon the eve of a great awakening in matters artistic. Tidings of the veritable renaissance in England under the leadership of William Morris and his associates had reached this country. It was the beginning of the Arts and Crafts movement, and it was given to Cincinnati to take the first step in its organized development in America. Mr. Benn Pitman had entered the Art School as an instructor, giving his services free during the establishment of a department in wood carving. Of this class, I have many pleasant recollections connected with the little coterie of congenial spirits that met in one of the smaller rooms and also with the gatherings in the large room on Saturday mornings to listen to the talks of Mr. Pitman on decorative art.

Under his inspiring leadership, our efforts were soon to be drawn into unexpected channels. In the exhibition of the Art School in 1874, some pieces of china painting executed by one of the pupils at home were shown, and we expressed a desire to learn something of the mysteries of this art. Mr. Pitman undertook to procure the necessary information and, on his return from his vacation trip to New York in that year, he brought some mineral colors. He also unearthed an instructor in the person of a young German woman who had learned the art in Berlin. Mr. Pitman then invited a group of his scholars in the wood-carving class to meet at his office and be instructed in the art of painting on china. Of this number, those who remained faithful to the practice thus instituted and who afterward formed the nucleus of the Pottery Club were Mrs. William Dodd, Mrs. George Dominick, Miss Alice B. Holabird, Mrs. Charles Kebler, Mrs. Harriet Leonard, Mrs. A. B. Merriam, Miss Clara C. Newton, Miss Julia Rice, and myself.

Clara Chipman Newton

Pottery Club, April, 1879. Miss Louise McLaughlin, *President;* Miss Clara Chipman Newton, *Secretary* (see E. A. Barber, The Pottery and Porcelain of the United States, p. 276). Later (1890) with Miss McLaughlin, *President,* and Miss Newton, *Secretary,* the Associated Artists of Cincinnati was organized (Barber, *loc. cit.,* p. 284). When, in 1880, Mrs. Maria Longworth Nichols (Mrs. Bellamy Storer) established Rookwood Pottery, Miss Newton was associated with her as manager (see Barber, *loc. cit.,* p. 288).

The Cincinnati Exhibit at the Centennial attracted much attention as its features of wood carving and china painting were novel and in advance of the women's work shown by other cities. My own contribution to this exhibit was a carved cabinet done under the direction of Mr. Henry Fry and a number of pieces of china painting.

It was while visiting the Centennial that I saw the faience made by the Havilands at Limoges, then exhibited for the first time in this country. The new ware in its exquisite coloring and novel effects was a revelation to me, and I immediately began to wonder how it was done and if I could not do something of the kind. I learned something of hard-fire colors and sent to Paris to procure some, but it was not until nearly a year had elapsed that my purpose was carried out. During this time I had been doing overglaze work and had prepared my first manual on this subject. It was not this that had delayed the purpose of carrying out the attempt in underglaze, however, as I remember that the writing of the manual took just two weeks. It was published that year and is now in its twenty-second or twenty-third thousand.

A visit to the pottery of Patrick Coultry in September, 1877, convinced me that my idea as to the method of the decoration used in the Haviland ware was correct, or rather that the process was slip painting and an evolution of that by which the common yellow or Rockingham ware was decorated with stripes of blue and white at this pottery. I carried home a vase in the raw clay upon which to experiment. It was a teapot turned upside down and minus the handle and spout. This piece came from the kiln in October, 1877, and while it was somewhat defective from the slip painting having been applied too thinly and thus revealing the yellow ground color underneath, it showed the feasibility of producing effects similar to the Haviland ware with the facilities at hand. This piece is now in the historical collection of the Pennsylvania Art Museum. A later piece, a pilgrim bottle which came from the kiln in January, 1878, was more successful; this piece, now in the Cincinnati Museum, represents the first work of this kind done in Cincinnati. Underglaze work had been done before; I did some myself in 1876 in blue on china made at the Greenpoint Factory, a specimen of which is also in the Museum. Mr. Volkmar executed his "Barbotine" ware about this time. The date of the establishment of his pottery at Merion, New Jersey, is given as 1878 in Mr. Barber's book, Pottery and Porcelain in the United States. The process was somewhat different and probably followed more closely the method pursued at Limoges, where Mr. Volkmar learned it while an art student in Paris. Mr. Robertson of Chelsea began to experiment with his process, which was probably identical with mine, about this time. As to priority, Mr. Volkmar may have come first and my experiments probably antedated Mr. Robertson's by a short time.

The shrinkage of the clay used in the decoration caused a good deal of difficulty in the first work and when used too thinly the yellow ground of the ware was exposed. I therefore welcomed the discovery of some fine red clay which had been brought to my notice by a friend, an old lady who remembered that years ago an English geologist whom she had met in the neighborhood of the deposit had remarked upon its fine quality. I procured some of this clay which was pronounced by the potters to be very fine and was thereafter always used for my ware.

The difficulties with the applied clay decoration would probably not have occurred if the "Barbotine" process used by Mr. Volkmar and which he learned at Limoges or Bourg-la-Reine, had been used. In this process, the applied clay had been previously fired and then ground into powder. In my ignorance of ceramic processes I had used unfired clay applied to a body in the wet state instead of, as in the other process, to a thoroughly dried body. Be that as it may, those who followed me here, having learned the process from the potter who fired my ware, adopted it, faults and all. It was not long until there were hosts of others in the field. I had been advised to patent the process but, although it has since been patented by others, I have never believed that a process, technically identical as it is with one which has been in common use for a very long time, could be so described that a valid claim for a patent could be made.

The ware which I had begun making in the latter part of 1877 was exhibited for the first time in a Loan Exhibition held on West Seventh Street in May, 1878, by the Women's Museum Association. It was also exhibited at the Exposition in Paris of that year and at a Loan Exhibition in New York.

On account of the origin of the style in Limoges, I had called my ware "Limoges Faience." Reporters, who could scarcely be expected to be entirely familiar with nice ceramic distinctions, confounded the name with that of the Limoges enamel, formerly made and now extremely valuable, and heralded the new ware as a rediscovery of a long-lost process. All this drew attention to it, and there were many who desired to practice the art of making it. These found instruction in a class which was formed at the Coultry Pottery in which were some young men who afterward composed the nucleus of the decorators of the Rookwood Pottery, which was founded in 1880. Aside from these art students, there were many others who took up the work of decorating pottery, persons gathered together without any regard to previous condition of knowledge of art or decoration. It may be imagined with what abandon the women of that time, whose efforts had been directed to the making of antimacassars or woolen afghans, threw themselves into the fascinating occupation of working in wet clay. The potters imparted to them various tricks of the trade and some fearful and wonderful things were produced. Not long ago, the proud possessor of some of these treasures showed me a pair of vases with a characteristic decoration of the period. While still wet, they had been rolled or otherwise peppered with fragments of dry clay until their surfaces were of the texture of nutmeg graters, while over all had been hung realistically colored bunches of fruit. For a time, it was a wild ceramic orgy during which much perfectly good clay was spoiled and numerous freaks created.

My own part in the matter I would gladly forget, for while I had no part in the direction of these ill-advised attempts, I was guilty of having shown what could be done with the facilities at hand, of having started it.

It was my first experience of what the world metes out to those who, in the language of our day, "start something," and I was credited with having done what I had never claimed to do while the acknowledgment of what I had done was withheld. Three potteries were started for the production of decorated ware as a result of the pervading interest in ceramic matters; of these, the Rookwood is the only one that has survived, a true survival of the fittest.

In 1879, the Pottery Club was organized and, composed as it was of the best workers in the different branches of ceramic decoration, did much to uphold the standard of good workmanship during the sixteen successful years of its existence. In the first year after it was organized, the workroom of the club was in the Dallas Pottery on Hamilton Road, where in the spring of 1880 was held the unique reception which drew a large crowd of the representative people of the city into the labyrinthine passages of the dusty old pottery to view the results of the first year's work. Later, the club followed the manager of this pottery, Mr. Joseph Baily, to the Rookwood which had just been opened at what is now known as Rookwood Crossing on Eastern Avenue.* As the pottery became established, there was less time and inclination to undertake outside work, and from force of circumstances we were obliged to abandon underglaze work and to return to the overglaze decoration which could be carried out without the resources of a pottery. Pieces of my work representing each year from 1878 to 1885 have been given to the Museum, including the large vase, thirty-eight inches high, to which was given the name "Ali Baba."

About 1885 I gave up my work in pottery and actually refrained from dabbling in wet clay for nearly ten years, and then returned to it only to try out a method of decoration with inlays of clay which I patented in 1895 and practiced for a short time. This work was carried on at the Brockmann Pottery, but again the disadvantage of not being able to control the entire process caused me to discontinue it. In the meantime, I had been occupied with overglaze decoration with metallic effects and with decorative etching on metal, which in 1889 was exhibited at the Exposition Universelle in Paris where it was awarded a silver medal. In 1892, I had a general exhibit at the Keppel Gallery in New York consisting of painting in oil, water-colors, miniatures, etchings, pottery, decorative metalwork, illuminations, embroideries, etc. In 1893, an exhibit of these various kinds of work formed a part of the exhibit in the Cincinnati Room at the World's Fair in Chicago.

Porcelain Making

One who has experienced the fascination of working in wet clay is never safe from its lure, and after a while I was again dreaming of the possibility of carrying out another ceramic venture, this time of much larger scope. This was no less than the making of porcelain, an enterprise the difficulty of which I had as yet but a faint conception. Had I been able to form an idea of this difficulty, it is

* For history of Rookwood Pottery, see *Bull. Amer. Ceram. Soc.*, **15** [12] 443–45 (1936).

doubtful if the Losanti ware would ever have existed. In previous experiments, the ware had been formed by a potter and returned to him for firing. Now I was to begin with the composition of the clay and carry the whole manufacture through to the final firing. This would be a necessity, as the kilns of none of the local potteries where earthenware was made would furnish the intense heat necessary for firing porcelain.

There is, of course, a distinguishing hardness to the glaze of porcelain, and there is also the peculiar ringing sound on being struck. The difference between earthenware and porcelain has been described as being similar to that between plaster and marble. In the making of earthenware, the first or "biscuit" firing is the hardest, while the glaze of "glass" firing is done at a lower temperature. The glaze of earthenware does not, therefore, penetrate beneath the surface. Porcelain, on the contrary, receives a very light firing the first time, leaving the ware in a very porous condition, of about the consistency of chalk, the glaze being then applied and subjected to a very high degree of temperature, usually 3000° Fahrenheit, or over. The glaze therefore penetrates the body, giving it a peculiar depth and brilliancy. The delicacy and fineness of the ware with the possibilities of rich coloring as well as the difficulties of the manufacture make porcelain the goal of the highest ambition of the potter.

All this I knew, but I had not considered the difficulty which confronts every maker of the ware in a new place or who undertakes the mixture of materials he has not combined before, that is, the necessity of taking into account the peculiarities of the natural ingredients at hand. This makes the problem of manufacturing porcelain a distinct one in every country and is possibly the reason that it has been made through such various processes.

A man who came to this country several years ago with the intention of starting a factory for the manufacture of porcelain told me that, having learned his trade in Germany, he was obliged to spend three thousand dollars in experiments after coming here before he was ready to begin the manufacture with American materials.

This fact had not entered into my calculations when my experiments were begun in 1898. Technical instruction also as to methods was not at that time available. Since then one or two expert ceramists have written detailed descriptions of processes which would have been invaluable to me if I could have availed myself of them. The only practical help I could find was the formula of the composition of the Sèvres paste, which gave the proportions of flint, feldspar, and kaolin used. The other compositions published in books at hand were chemical analyses which threw but little light upon the actual ingredients entering into the bodies and glazes. I thought that by giving a formula to a potter I could save myself the trouble of grinding and mixing the preparations, but the result proved that this was anything but a safe procedure.

Builds Her Own Kiln

As to the firing, after two abortive attempts in which I had invested in gas kilns, I found myself yet without the means of attaining the high temperature necessary for the firing of porcelain. At that time natural gas, which would have solved all my difficulties, had not been brought to the city. Finally I was advised to build a brick kiln, such as potters use, which could be fired with coal. If gas or petroleum were used, an engine would be necessary. The kiln constructed, a house was required as a shelter, so a small building was erected to serve this purpose and also that of a workroom. The place was in the rear of my garden and favorably situated as it was surrounded by open spaces on all sides save one, the north, where there were two houses some distance away and on a higher level. As the prevailing winds would most likely carry the smoke

House in Mt. Auburn where Miss McLaughlin's kiln was located. The kiln was at the end of the lot back of the house.

toward the vacant lots, I did not expect to have any trouble from that source as it was said that the smoke would only occur at the starting of the fire and thereafter for a short time when fuel was applied. During the latter part of the firing, the heat becomes so intense that the products of combustion are quickly turned into gases.

The day the kiln was tried to see if it would "draw" the wind was, unfortunately, from the south and it not only drew, but also drew the attention of the neighbors to the smoke which, as I was presently informed, annoyed them. Thereafter, together with the other troubles which came thick and fast, I had also this to reckon with. I was placed in the unfortunate position of one who finds it difficult to go forward and impossible to retreat. After having gone so far, I was determined to go far enough to bring about some results, so temporized. The neighbors appeared to have an idea that they would be poisoned by the fumes from the kiln which was harmless in that respect. One neighbor was a lawyer and was consulted by the other, while the advice of still another lawyer was sought and the smoke inspector was notified. That functionary came around on a day when nothing was going on so there was no offense to report and I was unmolested.

A trying-out of the kiln with some ware that had been prepared took place, an occasion of such tribulation both before, during, and after the performance that it will always be remembered, now with amusement; but at the time amusement was not unmixed with apprehension. As it was thought that the heat required could not be attained under eighteen hours and it would therefore be necessary to run into the night during firing, it had been arranged to

have a man who was a night fireman at the pottery take it on off nights. On this occasion, the head potter and the kiln builder sat up with the kiln although it had been started early in the day. It had proved uncommonly refractory, however, and the potter had declared there was something wrong with it. The kiln builder had been sent for in a pouring rain and had determined to stay in order to prove that his work was all right. In the early morning, they stole away leaving a note saying the kiln was "O.K." In order to test the firing capacity of the kiln, however, they had apparently forgotten the temperature at which a biscuit firing for porcelain should stop, and the result was that the pieces in this firing could never be glazed as they were too hard.

From the color of the ware it appeared that the potter had added some coloring matter under the idea that I would like to have the porcelain bear the bluish-white tint that is traditional among potters. As to this, I had not cared about the blue-white color but, as afterward was shown, he had made a more serious change in the formula in that he had given the mixture so large a proportion of feldspar that in the next glaze firing the pieces proved to be in so melting a mood that they had, as it were, fallen upon each other's neck, and the whole ceramic conglomerate was so firmly attached to its resting place that it was necessary to chop it out with a hatchet. Some relics of this catastrophe have been retained showing some beautiful effects of coloring in the glazes, effects which were never repeated.

That the body which the potter had prepared was too soft was apparent, and when he showed me the formula by which he had arrived at it, the faulty composition was evident even to my inexperience. Having received instructions to follow more closely the original formula given to him and to leave out any coloring matter, he prepared a new batch of clay which was used in a number of pieces made afterward. There was a firing in which twenty-seven pieces were broken or otherwise destroyed, and on another occasion several pieces were broken in setting the kiln, for previous to firing and even after the first firing, porcelain clay is exceedingly fragile. These mishaps and the preparation for another firing brought us to the first of June when there was a biscuit firing, the first of which I have kept a record, and two days later, a glaze firing. Perhaps two firings in such close succession were too severe a tax upon my neighbors and, to add to the difficulty, the night of the last firing was close and murky with an atmosphere that caused the smoke to hang around like a pall. It was a critical time, for I knew that the contents of this kiln were practically to determine the question between success and failure, if only the firing could proceed without the intervention of the police. Fortunately this was the case and, although the fireman was threatened with arrest during the night, the firing proceeded to the end.

From this kiln came an interesting piece of glaze from the transmutation of copper which is now in the historical collection of the Pennsylvania Museum, two others I have in my possession, and one was purchased by Paul Jeanneney, the artist potter of Paris, who said he would have given any amount to possess it as he had nothing like it in his collection. Neither have I nor do I know by what means it was brought about. I became aware, moreover, that while certain results had been achieved, I never could

Losanti ware (photo from *Keramic Studio*, December, 1901)

be quite certain as to the means unless I made the compositions myself, while the potter would prefer to have me remain dependent upon him for the mixing of the materials for which he was charging me a very high price. The whole situation called for a rearrangement and this, after some reflection, I entered upon.

In the first place a new fuel must be found in order to have peace, and I must also procure the raw materials and mix my own body and glaze for the ware. The question of fuel was finally settled by the choice of Connellsville coke, although I think this had never been used for such a purpose before. In use, however, it was extremely satisfactory as there was little smoke and the required temperature could be reached in a much shorter time, from seven and a half to nine hours, usually. This would permit me to superintend the process in daytime and render unnecessary the presence of the expert fireman who would be useless when the new fuel, of which he had no knowledge, was used. This coke was by far the most satisfactory of the four kinds of fuel I had used. Materials were also procured, and a series of trials of various mixtures for a porcelain body were begun during which nearly a hundred

compositions of bodies and glazes were tried. It was not until late in the year of 1900 that the composition that had proved satisfactory had been settled upon and it was even later, about March, 1901, that the best results were secured. During this period, it seemed as if every flaw that fire could produce upon pottery had shown itself in the ware that came from my kiln. Cracks, blisters, warping, it appeared that the whole category was lavished upon the unfortunate product. I remember one occasion, early in 1900, when on opening a kiln from which I had expected

Porcelain made by Louise McLaughlin

much, a new species of defect was encountered and my bad quarter of an hour was upon me. It was not longer than that, however, until I had pulled myself together and had determined to try again. Being of rather an optimistic temperament I declined to recognize defeat and continued until the processes were practically under control, although there is always in the ordeal of fire an element of the unexpected that only adds to the charm.

One-Fire Porcelain

In the latter part of 1900, I began to give the ware but one firing which is possible in the case of porcelain as the intense heat necessary to melt the glaze also must mature and vitrify the body. This was the practice of the Chinese, but European potters, possibly because they had always given earthenware two firings, continued this practice with porcelain. Perhaps, if they thought at all about the matter, they did not feel that it was worth while to adopt the custom of the Chinese who probably knew no better. Since practicing the method of one firing myself, I have come across the statement of some scientific man who had investigated the matter to the effect that the Chinese custom of firing porcelain but once was the cause of greater richness in the coloring and that this was the secret of the Chinese blue which has been an object of emulation to other potters.

The ware that had been produced had been exhibited first at the Spring Exhibition of the Cincinnati Museum in 1889, at the Paris Exhibition of 1900, at the Pan-American Exhibition of 1901, and also in the same year at the Exhibitions of the Allied Arts and the Keramic Society of New York, and at the Turin Exposition of 1902. It had been well received and had been commended by well-known critics both at home and abroad. A porcelain had been produced which could be fired at the unusually low temperature of about 1300°C, that is, 2372°F, even lower than that of the new Sèvres in which the temperature has been reduced to one much lower than that of the old ware. This increases the range of colors that can be attained in decoration and also must reduce the difficulties and expenses of firing.

The work is the most fascinating possible, laborious and exacting, it is true, yet the element of uncertainty and danger which accompanies it and renders the opening of the kiln after each firing an occasion of the liveliest interest in which the blending of hope and fear is very evenly balanced, all but adds to its compelling charm. I would give up much to indulge in its excitements and have done so, but I stopped short of putting my furniture into the kiln. The trials that have been recited are merely those which have always beset those who stray away from the beaten track in any field and are not to be mentioned beside those of many other potters.

The heartrending experiences of Pallissy are depicted in his memoirs where a most vivid description is given of his sensations when, after working with his kiln through the greater part of a stormy night, he goes into his house wet and muddy, only to meet the bitter reproaches of his wife. If there were objections in the neighborhood, I was free from interference in my own home.

It is said that Hugh Robertson slept night after night on a pile of shavings beside his kiln when he was trying to achieve the sang-de-boeuf glaze. My limit as to staying up with the kiln was one o'clock and that was done only once, but there were limits to my devotion to this most fascinating pursuit and having reached them I stopped short of doing all I had planned to do. Of all branches of pottery, the making of porcelain is the least exploited, the most interesting, the most worthy of pursuit. But it seemed wise for me to desist from following it further. Were circumstance to favor it, however, it is possible that I would again follow the will-o'-the-wisp that leads to the end of the potter's rainbow where there is seldom found a pot of gold.

Newspaper Accounts of Her Faience

War among the Potters*

There is a great deal of doubt as to when, exactly, Limoges ware was first discovered. Some say the knowledge of manufacturing it was lost for 100 years, until a comparatively short time ago, when it was revived in France. Others say the art has been practiced all along in England, and, indeed, that the characteristic of Limoges ware—color under a transparent glaze—has been known to every boy who has worked in a pottery in this country for years back—the only difference being that, in Limoges ware, paintings by the brush are produced. If a pure color be applied to pottery and a glaze be put on, and the ware then burned, the color will run off. And for years and years

* From *Cincinnati Daily Gazette*, October 7, 1880.

admirers of the ware in this country had failed in their attempts to imitate the French ware because they used pure colors. It never occurred to them to mix clay with their colors. Miss McLaughlin, of this city, has, by unanimous consent, been awarded the honor of being the first in this country to solve the problem successfully. She kept it a secret for some time, when it leaked out. Now it is nobody's secret.

But a modest young man from the East now comes forward and claims to be the discoverer of the process for making Limoges ware. And what is more, he has actually secured a patent right. His name is Mr. T. J. Wheatley. The young gentleman has a pottery on Hunt Street, where he turns out Limoges ware to order.

"Oh, yes," Mr. Wheatley said in reply to a question the other day. "I discovered the method of making Limoges ware. I struck the idea three years ago at New York, but the colors did not come out right, because of imperfect burning. I started this pottery six months ago. The application for the patent was made on the 21st of June, and the patent was issued on the 28th of September. I now employ four artists, but soon I will have two more. A Cincinnati capitalist has advanced me money and I am going to enlarge my pottery."

In after conversation, Mr. Wheatley said that as he now had the protection of the law he could afford to employ the best artists. The result of the issue of the patent to him would be that all the Limoges ware work in the United States would be concentrated at his pottery.

Mr. Wheatley had notified a number of manufacturers of the ware that he would institute proceedings against them did they not stop operations.

It is safe to say that Mr. Wheatley's warnings will be very little heeded, if at all, for there is no apprehension that his patent letters will stand.

Yesterday morning Mrs. George Ward Nichols* was visited at her private pottery, before described in these columns. Mrs. Nichols has utilized an old school house just near the crossing of the Little Miami Railroad on Front Street. She was found in an upstairs room painting some little clay articles, which to the unsophisticated eyes of the visitor looked like soup ladles with the handles broken off short. The pleasant little lady put down her brush, and her eyes twinkled merrily as she listened to how Mr. Wheatley was going to make her close her Limoges ware pottery.

"Why," she laughed, "Miss McLaughlin used to do Limoges work before Mr. Wheatley ever thought of such a thing. I knew the secret before he did. I don't see how he could get out a patent. He might as well get out a patent for wood carving. I might with better reason get out a patent for drawing dragons on vases, as I believe I was the first to do that here."

"And owls also," suggested the visitor, glancing at a sketch of the night bird on the shelf.

"Do you feel afraid of Mr. Wheatley instituting proceedings against you?"

"I don't care if he does," Mrs. Nichols said. "I shall go on building my pottery, and I hope to have the first fire in the kiln in a month's time. While my principal object is my own gratification, I hope to make the pottery pay expenses."

The reporter went to the Coultry Pottery on Dayton street, where a great deal of Limoges ware is made by ladies. The proprietor was not in, but the foreman answered all questions. He said ladies had been making Limoges ware ever since the Centennial and that the distinguishing feature of it was an old thing. If anybody was entitled to a patent right it was Miss McLaughlin. Wheatley had learned the art in their pottery. For him to get out a patent was a waste of money, for nobody would pay any attention to it, and if he did bring suit, no court in the country would find a verdict for him.

Information was next sought of Mr. George McLaughlin, Secretary of the Firemen's Insurance Company of Cincinnati, and a brother of the lady whose name is so prominently identified with this subject matter. Mr. McLaughlin ridiculed the claims of Mr. Wheatley. Fortunately he had kept memoranda, and turning to them, he gave the reporter the following interesting information about the discovery of the process by his sister:

"The discovery was made in the autumn of 1877, the first piece being taken from the kiln during the first week in October of that year. My sister had seen the Haviland ware at the Centennial Exposition in 1876, which was exhibited there for the first time, not having been at that time yet publicly exhibited in Europe. She came home full of the idea of making something like it. I accompanied her to the pottery of Mr. Coultry, on Dayton street, some time in the early part of September, 1877. In previous experiments in underglaze painting, the colors she had used had disappeared in the firing. At the pottery of Mr. Coultry, she saw the potters using the white slip which she noticed bore a resemblance to white paint. 'Slip' is a technical term in use among potters to designate any mixture of clay and water which can be used in a fluid state. Her knowledge of the use of white in painting in oil suggested the use of the slip, and with it the practical thought arose whether the clay itself, being largely a disintegrated mineral, would not protect the mineral oxides, of which the underglaze colors consist, from the action of fire. A vase in the wet clay state was sent home, with some white slip, and was painted as an experiment. The firing demonstrated the fact that her theories were correct. The colors were preserved in the firing, but, as might be supposed, a long and discouraging course of experiment was necessary to ascertain all the steps that should be followed to get a good and especially an artistic result, and to verify the conclusion that it was possible to produce results identical with the Haviland process. In other words, all the steps in an entire process had to be originated. This could only be arrived after many interchanges of different steps in different manners, and after a careful record of each fact, its final verification coming only with repeated experiments. An extended account of the whole matter appeared in the Cincinnati papers in December or January following. The process was put in practical use, and she continued to have vases and other pieces fired at Mr. Coultry's pottery for a period

* Mrs. Nichols later became Mrs. Bellamy Storer. At the time of her death in 1932, the Society published Mrs. Storer's own story of the founding of Rookwood Pottery (see *Bull. Amer. Ceram. Soc.*, **11** [6] 157-59 (1932). Mrs. Storer's photograph appeared on the *Bulletin* cover, December, 1936.

of over a year. In the early part of 1879 some pieces of ware were placed for sale at the store of Mr. Horace Huntington at the Race Street entrance of the Arcade. They were rude in design and evidently were inartistic and unpracticed efforts to use the central fact of the discovery, the mixture of paint and clay in pottery decoration. I made inquiries in the store as to the vases, and was told by Mr. Huntington that they were left by a young man he did not know, who stated they were made in Zanesville. They were, in fact, however, as I afterward found out, made at the pottery of Mr. Coultry, by a Mr. Wheatley, who had been taken into partnership by Mr. Coultry for the special purpose of manufacturing faience. Mr. Coultry was under no obligation or promise to conceal anything he might know of the process nor had he made any agreement not to manufacture the ware on his own account or for anyone else. The pains taken to conceal a matter for a few weeks, which would inevitably be found out, was entirely nonsensical. Mr. Coultry acted as he had a perfect right to do, but the execution of a private and distinct interest, which might have adverse influence upon results, of course justified my sister in determining to have no more pieces fired in Mr. Coultry's kilns and in building a kiln at the establishment of Mr. Dallas for her own use."

"When did these last-mentioned matters occur?"

"Mr. Coultry made an examination of his books and found that he fired the first piece for Mr. Wheatley in April, 1879. He gave me this information after his quarrel with Wheatley, and after the close of the lawsuit in which an immense number of vases, which constituted the partnership assets, were divided. A letter of Mr. Eli Perkins had appeared in the *Cincinnati Enquirer*, October 11, 1879, describing the main fact of the Haviland process as consisting of the admixture of clay and paint. The painting of enameled faience could be considered only as an open secret after that time."

"Did you have any idea of applying for a patent on your sister's behalf?"

"The question was duly considered. I have always had the idea that one's chance of making money out of a patent was about equal to that of being struck by lightning. My predisposition was against it, and the best legal advice in regard to this special matter confirmed my opinion. The admixture of clay and color is not a patentable thing. If it were, every pottery in the country would be at the mercy of the patentee. He could close them up at once or dictate his terms. They have been coloring clays and tinting with colors mixed with 'slip' ever since it was a trade. Mr. Wheatley's patent is not worth the paper it is written on."

"Is it not likely that the potters will give much heed to such a document?"

"No. It is very easy to get a patent, but it is hard to sustain one. No one knows better than Mr. Wheatley that he is not the first to discover what his patent describes, the admixture of clay and color in the decoration of pottery. No one knows better than Mr. Wheatley that it had been put in practical use before he made his first attempt. But if his patent, dated September 28, 1880, would stand fire in every other way, there is one step he has taken which is fatal to his intention. He has for a year past been engaged in teaching the art which he claims under his patent. He is estopped by such an act from setting up any claim whatever under an after-acquired patent. He should have become aware of this before he made his application at such a late date as June, 1880."

"Did your sister make any experiments in other kinds of underglaze painting before September, 1877?"

"In a letter which I discovered yesterday in my letter book, I find that pieces were forwarded to her as early as September, 1875, to Thos. C. Smith & Sons' Pottery at Greenpoint, L. I., opposite New York. A reference in the letter shows that some experiments were conducted some weeks previously at the pottery of Tempest, Brockmann & Co., in this city. I think there was nothing earlier."

It will now be in order for Mr. Wheatley to assert his legal right if he has any.

CORRESPONDENCE OF MARY LOUISE McLAUGHLIN

From a Letter January 24, 1938

"It was an application of decorating pottery with 'slip' known from time immemorial, but which introduced such possibilities as to colors and handling that it was really a new discovery. The friends who knew what I was doing said it was foolish to tell all I knew. At all events I did not think it necessary to take the public into my confidence. I had ventured into an experiment entirely novel to me and was only intent on bringing it to a successful outcome. That was my affair, as I had done all the work at home, having the unbaked clay pieces transported. This involved considerable risk, but the pieces were not fragile in constitution and it was possible. I therefore could refrain from giving information about it. Now I think this was a mistake because so much was said about it being a secret. I was even criticized for failing to inform other women about an occupation which might be of profit to them. However, the idea of making it financially profitable entered in and nothing could have made the desire to learn about it more intense.

"It happened at this time that the owner of the pottery where my work had been done happened to meet a young man at a wedding and engaged him in talk about pottery. This resulted in an offer of partnership. This young man, 'Wheatley,' had done a little work in the School of Design and readily accepted the offer, the potter giving him all the facilities the pottery offered for finding out the process. Shortly after this my brother, who was very much interested in my work at the pottery, saw some pieces of ware displayed in a window which resembled what I had been doing. These were said to have been made in Steubenville. I went to see them, and at once said that they had come from Coultry's pottery. My brother, who often visited the pottery, discovered that they had been concealing this from him. The proprietor denied any connection with Wheatley, but not long afterward when a dispute arose as to the division of profit from an exhibit which had been held in New York the matter came into the court and the whole arrangement was disclosed. This, of course, led to our leaving the Coultry pottery."

Portion of a Letter to Editor of The Bulletin on January 24, 1938

"When Mr. Wheatley was prepared to teach the process of decorating faience, the numerous students who wanted

to go into the work entered his class. At first, however, it was made up of some young art students who afterward became decorators at the Rookwood. John Rettig, afterward the successful conductor of 'Rome under Nero' and other spectacles; his brother, Martin Rettig, still living; Matt Daly, who recently died; and others with, I believe, Mr. Wareham, the present director of the Rookwood, a very talented man. When Mrs. Storer, with her father's aid, started Rookwood Pottery, these young men were chosen as the decorators. My friend and associate of many years, Miss Newton, who had been the secretary of the Pottery Club during the sixteen years of its existence was also the former schoolmate and close friend of Mrs. Storer. Mrs. Storer made her the business manager of Rookwood. This relationship continued during the years when the pottery was located at Rookwood Crossing on Front Street and was struggling to become self-sustaining.

"Mrs. Storer later married Bellamy Storer, who had been appointed Ambassador to Austria by President Theodore Roosevelt. Mrs. Storer then turned over the management of Rookwood to Mr. Taylor.

"The Rookwood Pottery was founded in 1880. My first piece of faience was fired in September 1877, three years before. In 1893, the Cincinnati Museum exhibited its work in various crafts in the Chicago World's Fair. Miss Newton, manager of Rookwood, had, in the catalogue describing the work exhibited, stated that my faience was the foundation of Rookwood.

"During the period when Rookwood Pottery was struggling to become self-supporting at Rookwood Crossing in Front Street, the Pottery Club rented a room and had work fired. That was the only association I had with Rookwood. That came to an end when Rookwood moved to the new building in Mount Adams and did not desire to do outside work. So ended my venture in faience pottery."

Letter Written of March 14, 1938

"Limoges faience was discovered at Bourg-la-Reine in 1875. That my work was a rediscovery of a very old process was a fiction of the reporters who wrote about it at first. The giving of the name 'Limoges faience' to my work was a mistake because of the difference in medium used. I should have corrected these mistakes at first. I make no claim of being the first to use the process of 'slip' painting, which, of course, had been known from time immemorial, whereas the basic principle of my 'Limoges faience' was new and a really novel discovery.

"The Bourg-la-Reine method, judged by strict rules of decoration, might not be defensible as applied to vases, but it certainly produced beautiful effects of color.

"I prefer, however, to rest my reputation as a ceramist upon the porcelain."

Miss McLaughlin Began Making Porcelain in 1898

Letter from Charles F. Binns, April, 1913

The New York State School of Clay-Working and Ceramics at Alfred University,
Alfred, N. Y.
Charles F. Binns, Director

April 22, 1913

My dear Miss McLaughlin:

I have just returned from the Exhibition at Rochester and wish to write my appreciation of your porcelain.

I specially like your pieces number 2, 13, and 17 in the catalogue. You are much to be commended for the manner in which you have overcome so many of the obstacles inherent to porcelain making.

Believe me, sincerely yours,

(Signed) Chas. F. Binns

M. Louise McLaughlin,* of Cincinnati, who has for several years been one of the best known artistic potters of America, has of late accomplished a great achievement—that of producing fine specimens in white, with an exceptionally fine glaze, which no less an authority than Henry Deakin pronounces almost equal to the matchless Chinese white porcelain. A dozen or more of her most recent creations are exhibited in the Deakin Gallery.

* *Chicago Record-Herald*, 1901.

FORTIETH ANNIVERSARY OF MISS Mc LAUGHLIN BEGINNING PORCELAIN MAKING RECOGNIZED BY HONORARY MEMBERSHIP

When the founders were meeting to organize the American Ceramic Society, Miss McLaughlin was beginning her work in porcelain. For her great accomplishments in the ceramic technology of underglaze, brush-painted faience, and in decorative, one-fire porcelain, the American Ceramic Society at its Fortieth Annual Meeting voted Miss McLaughlin an Honorary Membership.

ANNUAL REPORT ON GLASS*

By Alexander Silverman

The Works Progress Administration of the Federal Government seems anxious to promote projects of educational value which will benefit institutions of higher learning, scientists, and the industries. To help encourage this attitude of the United States Government, the writer proposed last fall the creation of a project to prepare a 1937 Annual Report on Glass. This project has been granted under No. 16535 to the City of Pittsburgh, and the writer has been appointed director of the project.

The group of individuals assigned includes a supervisor, an editor, three translators, two recorders, a clerk, and two typists. At present the supervisor and the editor have been appointed. They are both University of London graduates and one has had some training at Oxford. Two translators have been assigned, one a graduate of the École Polytechnique in Paris who has a command of Russian and French; the other studied at the University of Budapest and has a command of German and Italian. The first typist assigned has had library experience.

It would seem offhand that the individuals assigned were capable of taking hold of the situation immediately and progressing quite rapidly. As a matter of fact, the men listed have all had their training in science, even limited though it is, twenty or more years ago. They lack a knowledge of the modern developments and for this reason the University of Pittsburgh is permitting them to attend elementary science courses. They have practically no knowledge of the glass field and will have to be trained along these lines by the director.

In submitting this preliminary report, the writer wishes to make it clear to any one who plans a WPA project that it is a matter of take and give. Obviously, individuals who are fully prepared and thoroughly up to date have the best opportunity to obtain employment, and, except for occasional misfortunes which place a capable individual in the WPA category, the workers available must be trained to handle a project. If this proves possible, the Annual Reports may become a reality.

In preparing the Annual Report, recourse is had to abstracts which appear in various journals. If the abstracts seem adequate, nothing further is done than to record them in our files. If they are inadequate, a further search is made. If they report articles which appear in French, Russian, Italian, or German journals, translations can be made from the original. We plan to cover not only the abstracts which are on record, but to go through the 1937 files of all technical, trade, and art journals which are available, as well as books on glass which have appeared during that year. We hope to include glass substitutes as well as glass proper, and if our ambition is not too great, we should like to include a complete list of patents, both domestic and foreign.

Of course, the success of this plan will depend entirely on the possibility of training the individuals who have been assigned to do a competent and accurate job. Whether this can be done remains to be seen.

The University of Pittsburgh has provided headquarters, equipment, and supplies for the group. The Carnegie Library, the library of the Mellon Institute of Industrial Research, that of the Pittsburgh Station of the U. S. Bureau of Mines, and the writer's private library will provide material for a search of the literature. Where publications are not available in Pittsburgh, it is hoped that they may be borrowed through one of the local libraries from the Congressional Library, the Crerar Library in Chicago, the New York Public Library, the library of the American Ceramic Society, and others. With the coöperation of the libraries and scientific societies, we hope that a comprehensive report on glass for 1937 will result, together with a summary of new findings in the field during that year.

The writer realizes that the Annual Reports of the Society of Chemical Industry contain a chapter on new developments for the year. It would, however, seem desirable to have a volume which contains comprehensive information regarding developments in 1937, if such a volume is possible. Details concerning the printing and distribution of the volume are matters for future consideration.

Department of Chemistry
University of Pittsburgh,
Pittsburgh, Pennsylvania

* Presented at the Fortieth Annual Meeting, American Ceramic Society, New Orleans, La., March 29, 1938 (Glass Division). Received March 18, 1938.

ALUMINA-SILICA RELATIONSHIP IN GLASS*

By Alexander Silverman

In a number of papers published by H. H. Blau and the writer[1] on opal glasses, X-ray photograms indicated that the suspended solid phase consisted primarily of silica. When alumina was substituted for lime, the separation of silica was greater than in straight soda-lime glasses. The writer believes that this is due to a displacement of silica from silicates by alumina. X-ray photograms of silicates indicate the possibility of the aluminum atom replacing the silicon atom in the ion lattice. Depending on the type of

* A preliminary communication to the Editor. Received March 26, 1938.

[1] (*a*) H. H. Blau, A. Silverman, and V. Hicks, "Opal Glass: I, Silicon, Calcium, Sodium, Oxygen, and Fluorine Series," *Trans. 9th International Congress of Pure and Applied Chemistry*, **3**, 507 (1934).

(*b*) A. Silverman and H. H. Blau, "Liberation of Fluorine in Fluoride Glass Manufacture," *Ind. Eng. Chem.*, **26**, 1060 (1934).

(*c*) H. H. Blau, A. Silverman, and V. Hicks, "Opal Glass: II, Silicon, Calcium, Sodium, Aluminum, Oxygen, and Fluorine Series," *Jour. Amer. Ceram. Soc.*, **19** [3] 63–66 (1936).

silicate, aluminum will replace silicon in one proportion or another, and not according to the stoichiometric proportions used in chemical calculations, namely, $4Al_2O_3$ equivalent to $3SiO_2$.

The tendency of alumina to displace silica in varying proportions, depending on the type of silicate involved, together with observations cited concerning opal glasses, has led the writer to plan further researches. The old idea of substituting alumina for lime or other metallic oxides in glass batches seems wrong, except in highly acid glasses where the alumina might shift to the base position because of its amphoteric nature.

The first project involves the substitution of alumina for silica in clear soda-lime glasses to determine the extent to which this can be done under various conditions. This investigation will begin shortly. It is hoped that other investigations covering the displacement of silica by alumina in opal glasses will follow.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF PITTSBURGH
PITTSBURGH, PENNSYLVANIA

LETTER TO THE EDITOR

ORGANIC ELECTROLYTES FOR POTTERY USE

March 22, 1938

Can you give me any information as to what success has been had with the use of so-called organic electrolytes instead of the usual electrolytes used in potteries?

Have these so-called organic electrolytes actually been used under production conditions, and how do they compare in price with other electrolytes, and where are they available?

—J. A. TURNER, *Certain-teed Products Corp., Buffalo, N. Y.*

Editor's Reply

The answer to this question I can not give. I do not know to what extent organic electrolytes are being used, although I know that they are being experimented with and in some cases have been adopted for some purposes. I know nothing about the price or availability of such electrolytes.

I am going to broadcast your question in *The Bulletin* which this Society issues on the fifteenth of each month.

—R. C. PURDY

THE PRESIDENT'S PAGE

FRANKLIN INSTITUTE

The Franklin Institute was founded February 5, 1824, by Samuel Vaughan Merrick, assisted by William H. Keating. In the original group of founders were Matthias W. Baldwin, founder of the Baldwin Locomotive Works; Col. Peter A. Browne, attorney, who delivered the address at the laying of the cornerstone; and James Ronaldson, first President of the Institute.

Philip C. Staples is now president and Henry Butler Allen is secretary and director.

The Franklin Institute of the State of Pennsylvania was founded for and has been devoted to the promotion of the mechanic arts. It ranks as one of the most famous institutions in the world devoted to the advancement of science and the promotion of the mechanic arts.

This Institute is now and has been for more than one hundred years devoted to the increase of useful knowledge, to the encouragement of invention and discovery, and to the education of the public in the achievements of science and industry.

The Franklin Institute occupies a magnificent building on Benjamin Franklin Parkway and includes in its activities the following:

(*1*) *Committee on Science and the Arts:* This Committee, formed of sixty-six members of the Institute, reviews in detail many of the advances of science and technology. It recommends to the Board of Managers those persons deserving the annual awards of the Institute which are formally presented at Medal Day exercises in May. Among those to whom it recommended the Franklin Medal are Edison, Wright, Thomson, Rutherford, Bragg, Jeans, Fleming, Planck, Zeeman, Lenard, Nernst, Marconi, Einstein, Kettering, Jewett, and Millikan.

(*2*) *The Journal of the Franklin Institute:* This was founded in 1825. It has maintained its high scientific standards and at present an edition of more than 2600 copies is printed each month.

(*3*) *The Library:* The Library is one of the most complete and useful in the fields of science which it covers.

(*4*) *Lectures:* These are presented by distinguished scientists and others qualified to speak with authority on a subject related to science or industry. About 20 lectures are given each year.

(*5*) *Research:* From the laboratories of the Institute's Bartol Research Foundation and the Biochemical Research Foundation, additions are constantly being made to scientific knowledge.

(*6*) *Museum:* The Fels Planetarium and the Wonderland of Science with its more than four thousand action exhibits and sections devoted to astronomy, aviation, the graphic arts, chemistry, medicine, marine transportation, land transportation, music, electrical communications, illuminating engineering, railroad engineering, physics, fire fighting and prevention, materials of construction, prime movers, mechanisms, which, with its Franklin Hall, its seismograph and observatory, constitute the Institute Museum.

(*7*) *Traveling Shows:* Traveling shows are sent forth by the Institute. These shows are devoted to science.

(*8*) *Other Organizations:* Frequent use of the facilities and services of the Institute is made by other organizations, such as scientific and technical societies. (Some of the sections and divisions of the American Ceramic Society should avail themselves of these facilities.)

(*9*) *Other Public Offerings:* Special lectures, exhibitions, demonstrations, etc., are presented.

On May 19, 1938, the formal dedication of a national shrine to the memory of Benjamin Franklin, one of the greatest Americans, will take place. The new shrine is the Benjamin Franklin Memorial. This will comprise one of the most comprehensive and appropiate memorials ever designed to perpetuate the memory and promote the aims and ideals of an illustrious man.

The great statue is the work of James Earle Fraser, a noted sculptor.

On May 20, 1938, leading scientists and educators of two continents will give lectures at the Franklin Institute. On May 21, 1938, outstanding engineers and representatives of engineering and professional societies will speak on applied science.

One of the distinguished members of the American Ceramic Society, John C. Hostetter, received the Howard N. Potts Medal in 1937. This was in recognition of his contribution to the technology of glass. —VICTOR V. KELSEY

FREDERICK CARDER—HONORARY MEMBER

BY MAJOR E. HOLMES*

Frederick Carder was born and educated in England and in his student days was the recipient of the National Gold and Silver Medals for Sculpture. He became, at an early age, designer for one of the outstanding glass manufacturers of England.

He was Master of the Wordsley School of Art for ten years and teacher of glassmaking for the Staffordshire County Council. He was also personally responsible for important exhibitions, reports, and other activities before coming to this country in 1903 and starting the Steuben Glass Works at Corning, which he managed until 1931. The contributions from these works have helped to raise the standard of excellence of material and quality of design in glass in this country during the last twenty-five years.

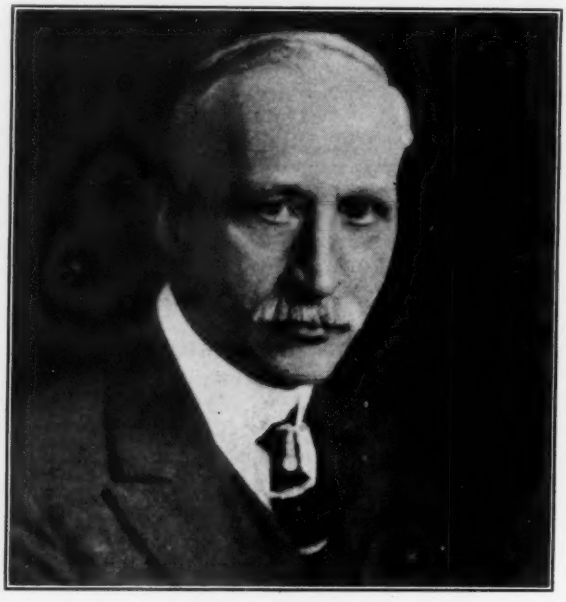
Exhibits have been shown at the Metropolitan Museum of New York for a number of years past. There is a large permanent exhibit at the Smithsonian Museum in Washington.

In the architectural field a number of installations have been made, prominent among them being the glass in the elevator lobbies of the Empire State Building, New York City, the large 55-foot panel screen in the Rockefeller Center Office Building, New York City, and in Corning Public Library, a window of sculptured glass commemorating "Sons of Corning," who gave their lives in the World War.

When the Steuben Glass Works was united with the Corning Glass Works, Mr. Carder became art director of the organization and has served since in that position.

In 1927 Mr. Carder was awarded the Friedsman Gold Medal by the Architectural League, which is awarded periodically for the highest service to art and industry.

He is a Fellow of the Royal Society of Arts, London; a Fellow of the American Ceramic Society; and a member of the Architectural League of New York, American Chemical Society, and the Illuminating Engineering Society.



Frederick Carder

In conferring Honorary Membership upon Frederick Carder, Dean of American artists in the glass field, the American Ceramic Society is honored in turn.

* Dean of Ceramic Engineering, Alfred University, Alfred, N. Y.

LUCIEN DELLOYE—HONORARY MEMBER

BY ALEXANDER SILVERMAN

Lucien Delloye, who resides at 102 Avenue de Villiers, Paris (17°), France, was born June 24, 1856. His studies interrupted in France by the Franco-Prussian War when he was only 16 years old, he, with his family, took refuge in London in 1872. He obtained employment with a commission merchant who exported to France and imported French merchandise.

Attracted to the engineering profession, he returned to Paris in March, 1875, and, after a five-month self-preparation, he was admitted in October to the École Centrale. In 1878, he received the degree of mechanical engineer.

After spending ten months in a patent office, he specialized in the study of commercial gaseous fuels. In 1881, he was engaged by the Saint Gobain Company to perfect methods and devices for polishing plate glass, the ingenious applications of which some members of the American Ceramic Society saw during their visit to France in 1928.

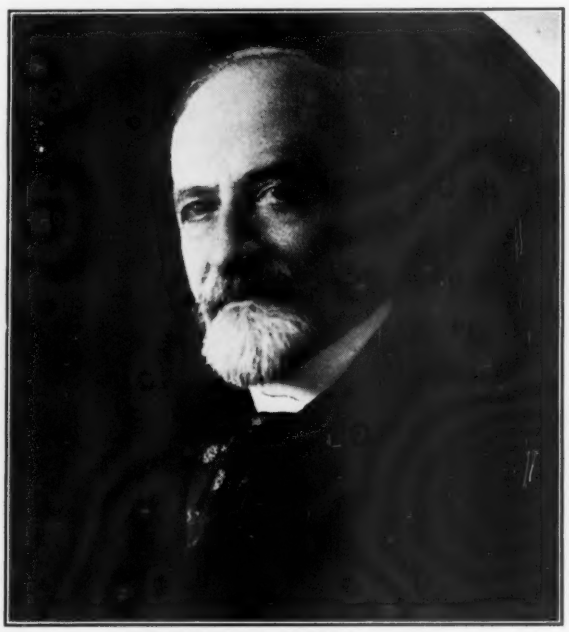
1882 finds him in Chauny; 1884 in Cirey, Stolberg;

from 1889 to 1891, he was in charge of construction in Mannheim-Waldhof, and from 1891 to 1896 in Pisa, Italy.

In 1896, he was made assistant to the director-general of the Saint Gobain Company factories in Paris. Feeling that an important export trade could be established in Belgium, he constructed a special factory for this purpose in Franière in 1898.

In 1903, on the death of Alfred Biver, his immediate superior, he became director-general of the Saint Gobain factories.

With the help of Belgian manufacturers, he organized in 1904 an International Association of Glass Manufacturers, of which he became the first president. He held this office for more than thirty years.



Lucien Delloye

In 1908, he built a glass factory in Arija, Spain, and improved and remodeled factories in Sas-de-Gand, Holland, and in Altwasser and Herzogenrath, Germany.

During the World War (1914–1917), the optical glass industry of France made real progress under his guidance. A plant was built at Bagneaux-sur-Loing, which was consolidated with other plants of Parra-Mantois. Soon after the war he constructed a factory for the production of fused quartz and heat-resisting glass at Nemours.

The Society of Civil Engineers of France elected him president in 1924. At the time of his installation, he was given commendation for having more than doubled the output of the Saint Gobain Company from 1904 to 1914 in factories in France, Belgium, Holland, Germany, Czechoslovakia, Italy, and Spain, as well as for his efficient reconstruction of the industry after the World War. Having served as director of numerous glass organizations affiliated with the Saint Gobain Company for many years, Monsieur Delloye resigned as director-general in 1934, to become advisory consulting director. In 1936, he was made an honorary vice-president of Saint Gobain. He still holds the title of consulting engineer of Saint Gobain and affiliated companies.

In 1937, the Society of Glass Technology of England elected him an honorary fellow. He is a past vice-president of the Chamber of Commerce of France and the Rhenish Provinces; he has also served as administrative secretary of the Society for the Protection of French Interests abroad and as a member of the Franco-Belgian Entente. He has served not only his employers but has rendered signal service to his country.

The writer recalls the tall, distinguished gentleman who received the members of the American Ceramic Society for Saint Gobain, during the tour of France in 1928. With his gracious manner, pleasant smile, immaculate appearance, quiet dignity, Monsieur Delloye welcomed our group and not only assured us that we were wanted, but saw to it that we were shown every detail of the operation of the plants which we visited.

The factories which he designed and directed give evidence of his originality and inventive genius. Their perfection, the smooth operation of every device, indicates the practicality of equipment which he created.

Lucien Delloye, who is now in his eighty-second year, is a master mind in the field of engineering. The glass industry is eternally his debtor. As a man and as an engineer, he is an honor to the American Ceramic Society, which has but recently honored him.

ANNUAL REPORTS OF STANDING COMMITTEES

REPORT OF COMMITTEE ON PATENTS

Foreword

There are pending before both houses of Congress a considerable number of bills bearing on patents. A substantial number of them appear to have been inspired by the announced aims of the administration concerning monopolies, patent pools, and other so-called abuses of the patent system. Some of them would work changes in that system so fundamental as to alter its character radically. Without entering into details and while recognizing that some changes in our patent laws are quite desirable, your Committee believes that many of these proposed changes are ill-advised, at least in the light of our present knowledge, either because they strike at the very roots of a system that is overwhelmingly believed to be responsible in large measure for the industrial success of this country, or because there are insufficient data to sustain the hypotheses on which the changes are predicated. Before changing a system that has stood the test of 100 years,

ample proof of the necessity for change should be present.

Some of the bills to which reference is made would apparently produce a result entirely contrary to the idea which motivates them, such as that which would eliminate patents on labor-saving devices, the compulsory licensing bill, or that which would end the life of a patent if not worked within five years after the grant. Such bills would tend to discourage new industries and progress in the existing ones, yet an aim of the administration is to promote industrial spending. The President's National Resources Committee envisages new industries in its 1937 report, yet the tremendous development expense involved in many new industries may well be not forthcoming if these proposed changes are enacted into law. And some of the changes are contrary to the findings of that Committee and the recommendations of the Science Advisory Board made after exhaustive inquiry.

For the most part, the bills referred to seem to have been hastily introduced without due thought and inquiry, unlike some of the truly meritorious proposals, such as the bill providing for a single court of appeals for patents of nation-wide jurisdiction.

The Committee reports herewith on those bills deemed to be of interest to the Society. Copies of the bills are appended.

Your Committee has not considered any bills pertaining to trade-marks, copyrights, and designs, of which a number of importance are pending in Congress. These appear to be beyond the ambit of this Committee under its present name, Committee on Patents.

Single Court of Patent Appeals

As early as 1898 there was agitation for a single court to hear all appeals in patent cases throughout the entire country. Since then a number of bills have been before Congress to that end, and at present three such bills are pending.

One, S. 475, was introduced into the Senate by Mr. McAdoo. Hearings on this bill before the Senate Committee on Patents were held, at which considerable testimony for and against the bill was given. The bill was then reported out of Committee in a modified form.

In its present form, this bill would establish a Court of Appeals to be made up of judges who have demonstrated special aptitude in patent law, which shall have exclusive appellate jurisdiction to review by appeal issues arising under the patent laws of the United States. This jurisdiction includes all suits for infringement, including questions as to the granting or refusal of injunctions, bills in equity involving interferences (under R.S. 4915) and interfering patents (under R.S. 4918), and declaratory judgment actions arising under the patent laws. In other words, the present jurisdiction of the existing ten Circuit Courts of Appeals over patent causes would be transferred to the new Court of Appeals for patents.

A number of substantial advantages are advanced by the proponents of such a bill. One of the most important of these arises from the existing situation, under which a patent may be held valid in one circuit and invalid in another, thereby creating the anomalous situation of having a patent granted by the United States enforceable in one portion of the country and unenforceable in another. While such cases may be reviewed by the Supreme Court, there is no obligation on the Supreme Court to take up any patent case.

Under the existing system, the owner of a patent which is held invalid in one circuit may sue in other circuits. Not only is the expense of litigation greatly magnified thereby, but also the result is disturbing to industry because of the uncertainty which exists in the period of such protracted litigation.

The single Court of Patent Appeals would have nation-wide jurisdiction; consequently, once a patent would be held valid or invalid, that status would apply once and for all to the entire country. This would curtail litigation costs and reduce the time and the volume of litigation.

Another and quite important advantage of such a court is that it would render the interpretation of patent law uniform throughout the country. There are phases of patent law as to which at present one Circuit Court of Appeals may be liberal, while being strict upon another, the reverse being true in other circuits. This tends to confusion and to difficulty in giving a decisive opinion as to many phases of patent law. This situation would be eliminated by the proposed single Court of Patent Appeals.

There are numerous arguments advanced against the bill by its antagonists. One of these is that such a court would become too technical. It is felt, however, that all disadvantages asserted are more than outweighed by the major advantages which would accrue to the public at large. This is indicated by its wide approval.

In 1935, the Science Advisory Board submitted a report on the relation of the patent system to the stimulation of new industries. Its recommendations included the establishment of a single court for patent appeals, such as provided for by S. 475. The establishment of such a court has been approved also by the American Society for the Advancement of Science, representing 150 scientific and technical groups with a membership of approximately 750,000. It has been endorsed also by the Business Advisory Counsel of the Secretary of Commerce, by the present Commissioner of Patents, and by the Patent Office Advisory Committee whose membership includes both business men and patent lawyers.

One provision of S. 475 appears to be undesirable, *viz.*, that there shall be appointed three engineers to act as technical advisers to the court. To be of value, such advice must be that of an expert in the particular art involved in any given case, but certainly at the present time no three engineers can be experts in every field which is involved in patent ligitation, nor would it be possible for them to keep abreast of modern developments in every field of science and technology. Finally, it is beyond dispute that as to many phases of science, different individuals hold different views, in consequence of which the court might decide a case improperly through advice based upon a bias as to some particular question when in fact the majority of scientists would hold a contrary view.

The fact of the matter is that such scientific experts have no place in a Court of Appeals. Their place is in the trial of a cause in a district court, and it may be noted that the Science Advisory Board recommended providing technical advisers for the district courts, not for the appellate court which it recommended. Furthermore, their recommendation was that such advisers should be selected

at large, there being selected for each suit an adviser who is manifestly qualified to pass upon the questions involved.

Apart from this one provision, however, the bill appears to be well drawn and to be meritorious in principle. The advantages which will accrue to industry from such a court are probably such that the bill should be passed despite its provision for technical advisers. Since the bill is still in a formative stage, however, it is recommended that Congress be urged to eliminate this undesirable provision, and to pass the bill with its other provisions.

A bill corresponding to S. 475 in its original form was introduced into the House of Representatives as H.R. 5636. As far as is known, no hearings have been held on that bill, but in view of the revision of S. 475 following hearings, it seems likely that the House bill will be revised correspondingly.

Still another bill to the same end was introduced into the House as H.R. 5855. Essentially it is the same except that it provides that the Court of Appeals shall sit permanently in Washington, and does not provide for the appointment of scientific advisers. Probably the most satisfactory type of court would be an ambulatory one, such as provided by S. 475, the court sitting at different points in the country at regular intervals.

Compulsory Licensing

The subject of compulsory licensing is one of the hardy perennials of proposed patent legislation because, in one form or another, it has been before Congress many times during the past hundred years. In 1832, the Patent Statutes were amended to introduce a working clause which was apparently unsatisfactory because it was deliberately repealed in 1836. Since that time, a whole series of bills providing for compulsory licensing of patents have been introduced into Congress, and exhaustive investigations and hearings were held on some of them, as a result of which the bills have consistently failed of passage.

Since 1836, a patentee's right is that of excluding others from the making, using, and selling of the patented invention, and the courts have repeatedly held that the patent owner may enjoy this "exclusive right," defined by the Constitution, as he sees fit. That is, it is for him alone to decide whether or not any use is to be made of the invention. Any bill looking to compulsory licensing therefore constitutes a most radical change in the patent law as it has existed for more than one hundred years.

Before such a revolutionary change in our patent law is made, there should be some assurance that it is so necessary to correct existing conditions or that it will encourage the establishment of new industries and increase employment as to justify its adoption. Such evidence is not now available, and the consensus of opinion derived from extensive consideration of prior proposals for compulsory licensing is against this proposed change.

In 1912, Congress held twenty-seven hearings with reference to the Oldfield compulsory licensing bill. The evidence adduced revealed a surprising unanimity of opinion against the enactment of a compulsory licensing law, the sentiment of patentees, inventors, and manufacturers being overwhelmingly opposed to such a law. Again, hearings were given on the so-called Stanley bills, making a similar proposal, and not only did leading manufacturers then oppose compulsory licensing, but the National Association of Manufacturers also strongly condemned working and compulsory licensing requirements. The Patent Bar has consistently opposed such a law as being contrary to the best interests of the country.

There is no reason at present to believe that there has been any material change in the attitude of inventors and manufacturers since the prior proposals. The recent investigation of the President's National Resources Committee indicated that there is insufficient information upon which to base a conclusion that this change is necessary or desirable. In its report in 1937, the Committee stated that

> "the fundamental problem of the working of our social institutions for eliciting, paying for, and securing early and wide use of desirable inventions has never been completely examined. It is a problem calling for a national policy."

Until such an examination has been made it is evident that, in the light of past experience, so radical a change as the present one is not justified.

Perhaps some of the agitation for a compulsory licensing law is predicated on the fact that the patent laws of many foreign countries include such a provision, and upon the idea, by no means sustainable, that valuable patented inventions are deliberately and improperly suppressed in this country. In this connection, it is worth while to refer to the testimony given before Congress in 1936, in connection with H.R. 4523, by Lawrence Langner, of a firm of patent lawyers who are intimately associated with the practice of patent law in every country in the world. On the questions of compulsory licensing and of suppression of inventions, Mr. Langner's testimony was enlightening:

> "The Chairman: You think that a man who invents something and who is given a patent based upon article I, section 8 of the Constitution, should have the right to suppress the patent if he so wills?
>
> "Mr. Langner: There is only one alternative, which is compulsory licenses. I feel that the damage done to the general encouragement of invention by the adoption of compulsory licensing, which damage I have seen personally in all the other patent systems of the world, is so great that I would rather risk what I regard as an academic possibility of somebody at some time suppressing a wonderful invention than I would changing our whole patent system and jeopardizing it by introducing compulsory licenses.
>
> "I may say that in all the years I have been in the practice I have never been told about this particular invention that got suppressed. I have often heard it discussed among laymen, but I have never known of a particular invention residing in the safe of some corporation which would revolutionize the industry. The answer is that if it would revolutionize the industry there would be the greatest incentive in the world to put it into practice.
>
> "The Chairman: Do not many corporations buy up patents with the object of suppressing them because they do not want to give up their machinery, their equipment, and the money that they have invested, and it is far better for them to buy the patent than to have the owners of the patent compete against them?
>
> "Mr. Langner: I think that would be much more true of foreign countries than in the United States. As a matter of fact, European manufacturers laugh at our manufacturers because of the extraordinary habit we have of scrapping existing machinery and putting in new machinery. You know perfectly well that we scrap our automobiles when they are 2 years old, and they could run for 10 if we had the European attitude toward them."

Not only were the hearings on the Oldfield and the Stanley bills many years ago replete with testimony exhibiting the general opinion that compulsory licensing had not been worth while abroad, but evidently at the present time persons well informed on the subject consider it to be unsatisfactory. Compulsory licensing has been said to be merely a system of legalized piracy.

It is worthy of note also that the Science Advisory Board in 1935 recommended against the adoption of a compulsory licensing system at this time, after serious consideration of the problems involved. Their conclusion was that the problem has not as yet been constructively analyzed with the completeness which should precede any such fundamental alteration in our patent system.

The bill now before the House, H.R. 9259, is of unsatisfactory character, apart from any question of the desirability of legislation on this principle. It would revise the statute (R.S. 4884) to restrict the exclusive right to make, use, and sell an invention to the first three years of the patent life; thereafter the patent owner would have only the exclusive right to a royalty through the licensing of the invention. After three years, any person may petition the Commissioner of Patents for the grant of a compulsory license upon a showing (1) of financial responsibility and ability to manufacture the patented article, (2) that the public interest will be advanced through the license, and (3) of specific terms, conditions, and royalties proposed for the license. If the Commissioner of Patents decides that the public interest will be served by the granting of a license, a hearing is held to determine whether or not the license shall be granted.

Some prior bills have provided that such licenses be granted only when the patent owner is not working the invention or does not sufficiently supply the public demand. The present bill is much broader in this regard because the only provision is that the petitioner show that the public interest will be advanced. Conceivably he could do this by asserting that competition would be to the public interest, and the license be granted, although the patent owner be supplying the entire requirements of the trade, under reasonable terms. The only excuse for a bill of this type is to correct an abuse; the foregoing provisions of the bill may well create abuses and perversion of the patent system more serious than those alleged to exist now.

It should be noted further that under the bill as drawn a foreigner could come into this country and petition for such a license, but no reason is apparent why foreigners should be given this right.

Under Section 6 of the bill, the patent owner may appeal to a Board of Appeals, but only with respect to the royalties and other conditions of the license, and no provision is made for an appeal on the question of whether or not a license should be granted. This may seem to be covered by Section 7, but there is doubt whether appeal on the merits is actually provided for.

Revolutionary legislation of this type should not be hastily accomplished.

It is recommended that this bill be disapproved.

Labor-Saving Machines

H.R. 8508 is a bill introduced into the House of Representatives a few months ago in accordance with which the issuance of patents covering any labor-saving machine or improvement thereon would be discontinued.

Presumably the object of this bill is to increase employment through elimination of patents on labor-saving devices. It is extremely doubtful whether such a result could be achieved in this manner, and it is rather apparent that the bill is an injudicious one.

In the first place, the provision of the bill appears to be unworkable in the extreme. The question arises immediately as to what is a labor-saving machine. The term is not qualified in any manner whatsoever in the bill and therefore is to be taken in its broadest connotation. As thus construed, this act could be taken to apply to almost any machine at the present day. For instance, a vacuum cleaner is a labor-saving device, as are also churns, electric refrigerators, and innumerable devices of the most varied character. To carry it to extremes, even can openers and nut crackers are labor-saving devices. But even in the ordinary sense of the phrase, brick-making machinery, glass feeders, and automatic machinery of any kind used in the ceramic arts are all within the term of the bill.

A major question that arises is whether the bill can achieve its intended effect. The mere failure to issue patents for labor-saving devices will not totally prevent their invention and their adoption in the trade. Moreover, the bill may have exactly the reverse of the effect to which it is aimed. Thus, the owner of a patent on a so-called labor-saving device, such as an automatic brick-making machine, might feel the invention to be so valuable as to refuse to permit others to construct and use such machines. The effect of a patent on that machine, as far as concerns total employment, would therefore be negligible. However, in the absence of a patent on such a machine everyone in the business would be free to construct and use such machines, whereby large numbers of men might be thrown out of employment. If, therefore, patents on labor-saving machines are to be discontinued, the result will be to permit anyone to build and use the machines used by his competitors, and in this age of increased use of automatic machinery, the theoretical result will be exactly the reverse of that aimed at by this bill.

It should be noted that careful investigation does not support the view that the advent and increasing use of labor-saving devices have increased total unemployment. At the request of the President, the National Resources Committee submitted in 1937 a comprehensive report of almost 400 pages on Technological Trends and National Policy, Including the Social Implications of New Inventions. One of the composite findings of the Committee was as follows:

"2. Although technological unemployment is one of the most tragic effects of the sudden adoption of many new inventions (which may be likened to an immigration of iron men), inventions create jobs as well as take them away. While some technological changes have resulted in the complete elimination of occupations and even entire industries, the same or other changes have called into being new occupations, services, and industries."

The report includes a section on "Unemployment and Increasing Productivity," in which there is the following statement:

"Except in very rare cases, the effect of strictly tech-

nical changes on employment in a single industry or even a single plant can not be isolated."

The report is quite conclusive to the effect that the data presently available do not justify the conclusion that increased production, as from labor-saving devices, is a major factor in unemployment. This is indicated by the following statements appearing in the section to which reference has just been made:

"A technological change, however, may also stimulate employment in the same or other industries to such a degree as to offset its displacement effects by the absorption of an equivalent number, though not necessarily the same workers. As indicated in the following pages, there are no data available which would measure adequately the extent to which individual workers are affected by the displacement and absorption effects of technological improvements."

"To measure the full effect of even a single technological change on displacement and absorption would therefore necessitate the virtually impossible task of tracing it through the innumerable factors which bear on the total volume of production and employment. Making direct inquiry among employers and workers would not be feasible either, since frequently neither the worker who loses his job nor the employer who lays him off knows whether the lay-off is the result of technological improvements or not. Assume, for example, two factories, A and B, located in different parts of the country and producing the same commodity for sale on the national market. Factory A introduces labor-saving machinery which results in increased productivity and lower costs, making a reduction in price possible. Factory B, which has not introduced the new machines and can not meet the lower prices of A, fails to get its usual volume of orders and is forced to lay off part of its working force due to 'slow' business. While neither the laid-off workers nor the employer may be aware of the situation, the workers were displaced by the introduction of the new machines just as truly as if the machines had been installed in their own plant. Indeed, had the machines been installed in plant B they might have kept their jobs, with the displacement occurring elsewhere. A somewhat analogous situation presents itself when a producer operating a number of plants finds it profitable to modernize several plants, to shut down the least efficient ones, and to continue to produce the same amount of goods as before."

The report implies, by one of its conclusions, that actually we must increase automatic, or labor-saving, machinery, because, with reference to improvement in the unemployment situation, the final paragraph of the section quoted states:

"The outlook for the immediate future seems to be in the direction of further technological progress toward a level of productivity substantially higher than that attained prior to 1929."

Industrial technologists are likewise of the opinion that labor-saving devices have not increased unemployment. Testimony definite to this point was given in the hearings before the House of Representatives Committee on Patents in 1935 in connection with H.R. 4523, a bill pertaining to the pooling of patents. The testimony of Frank B. Jewett, Vice-President of the American Telephone & Telegraph Company, and President of the Bell Telephone Laboratories, showed (Hearings, Vol. 1, pp. 284–85) that the dial telephone is a labor-saving device. Thus, in a metropolitan area, the operator of a manual phone does not have access to all of the subscribers' lines, there being many central offices, and it may require as many as three operators to complete a call. With the dial system, on the other hand, the call is fully mechanical, on which basis it might be argued that the dial telephone is a labor-saving device of the most obnoxious kind. Nevertheless, unemployment did not follow the introduction of the dial system:

"Mr. Dunn: Doctor, I want to get some information relative to the dial system. What effect did that have on its employees? By the invention of the dial system, how many employees were dismissed from their jobs?

"Dr. Jewett: As far as I know, none.

"Mr. Dunn: None at all?

"Dr. Jewett: No. I will tell you what actually happened: The dial system, of course, came into principal use in the biggest cities. That was the place where it was of the greatest value. Now the dial system *per se*—no dial system is divorced of the use of human operators, and the more you use it the more operators you have to have for certain kinds of service It is true you do not use them in the originating office to answer your dial. The introduction of the dial was not sufficiently fast to more than keep pace—it did not even keep pace with the enormous turn-over of operators There may have been an occasional spot somewhere where, temporarily, a few people were let go; but, in a city like New York, the curve indicates that all up to the period of the depression, which came along after the dial was put in, the number of operators was actually going up all of the time despite the fact that dial stations were going in.

"Now, in addition to that, of course the fact that the dial telephone and all of its equipment requires anywhere from two to four times as much manufacturing effort and installation effort as the manually operated telephone, it meant the number of people employed in the manufacture and installation side went up very greatly as the old installation was replaced by the dial."

In the same hearings, Edgar S. Bloom, President of the Western Electric Company, testified similarly:

"Mr. O'Malley: How many employees did that development [dial telephone] eliminate in the way of operators?

"Mr. Bloom: Well, I don't know; but, in sum total, the last time I checked it, I do not think it had any substantial effect at all. Of course, some operators, in some cases, were released, but the number of men required for building that apparatus and the men required to maintain it, I think, when you take the sum total, there would not be much variation. Of course, if we had done it overnight, there would have been; but, you see, with the growth of the business, they put in a division of automatic equipment in the particular community and absorbed those girls on the toll end and in the clerical work. We planned it that way. But, of course, if we had gone at it rashly and converted the whole United States overnight, it would have had that effect."

Finally, it would appear that in its object this bill conflicts with a major aim of the administration, namely, to shorten the hours of labor and to increase the leisure time of the peoples of this country. Labor-saving devices help to achieve that end. The growth of the machine age, with increasing development of labor-saving machinery and increase in the national wealth, in turn provided greater buying power and improved living conditions of workers. To revert to hand operations would therefore be to return to the era represented by the period prior to and the early part of the present machine age.

It is recommended that this bill should be disapproved.

Product of Process

A bill introduced recently into the House of Representatives, H.R. 7851, has for its object to prevent the importation into the United States of any product made, produced, or mined under or by a *process* covered by a claim of an unexpired United States Letters Patent, except where this is done with the authority of the owner of such patent.

Although a given product may be old and therefore unpatentable, a novel process for producing it may be patentable. In such a case, the claims of the patent afford protection only for the process itself and none for the product. Where such a process is not patented in foreign countries, it is permissible for the process to be operated in such countries, the product being shipped into this country, and it is this situation which has inspired this bill.

This bill involves a fundamental change in our patent structure, and one which in principle seems undesirable. That is, if a given product or material is old *per se*, there is no reason why the inventor of a new process of producing it should be given any sort of monopoly over the product itself.

Extreme difficulties would be encountered in the enforcement of such a law. For the owner of a process under this proposed law to prevail, it would be necessary for him to convince a court that the product in controversy had been made by his process. Unquestionably there are a great many materials and products which would not disclose by any known mode of examination the process by which they were produced. The difficulties of such proof might materially increase the costs of litigation, and the existence of such a law would pave the way for harrassing importers.

What appears to be an important reason for not passing this bill at this time is that it would restrict international trade, for which reason the bill is unwise in view of international trade conditions and relations.

Another bill directed to the same end, H.R. 5725, proposes to achieve this result by amending the Tariff Act to provide that unfair competition in the importation of articles into the United States, in consequence of which they may be excluded from entry, shall include the importation of products produced in a foreign country by means of a process covered by an unexpired United States patent.

In all probability the number of instances in which products are introduced into this country made by a process patented here but not abroad is so small as not to justify the passage of either of these bills. The direct remedy is to patent the process in those countries where manufacture is likely to be undertaken, whereby producers would be liable to penalties of the patent law in such countries. Another way of handling the situation, assuming that it would not be unwise in view of international trade relations, would be through adjustment of tariff duties upon any particular product.

It is recommended that this bill be disapproved.

Restrictions upon Patents and Patentees

Anti-Trust Laws: H.R. 7457 aims to amend the Clayton Act to make patent pools unlawful. Under this proposed act any person, which term includes corporations, participating in a patent pool, or combination of inventors, would be deprived of relief under the patent laws of the United States. In addition, those who have entered into such a pool would be subject to the penalties of the Clayton Act upon leasing, licensing, or selling any patented article on terms which would deny the user of the article the right of buying repair parts from other persons than the lessor, licenser, or seller.

This bill, while it may not have the support of the administration, is in line with the announced policy of the administration in attacking monopolies. First, it would eliminate patent pools, and second, it is aimed at eliminating control of the sale of repair parts for patented machines. The Supreme Court has held some patent pools valid, others invalid, depending on circumstances, and it is believed that questions of the propriety of such pools may better be left to the courts rather than to such a statute. Likewise, the law of repair parts is at present active, and perhaps in a state of flux; from the prior decisions, it is believed that the courts themselves will evolve a satisfactory solution of the problem and especially will this be so if a single Court of Patent Appeals is created.

It is recommended that this bill be disapproved.

Patent Grant: Under the existing statutes the grant of a patent conveys the exclusive right to make, use, and sell the invention which it covers. A bill in the House, H.R. 7811, proposes to change the statute (R.S. 4884) to eliminate the word "use" so that the grant would convey only the exclusive right to make and sell.

This bill appears to be directed to the same ends as the compulsory licensing bill, namely, to permit wider use of inventions and to eliminate the so-called evil of suppression of inventions. Under this bill, no patent on a process would have any value because the patentee would have no right to exclude others from its *use*. Apart from processes, the act would probably have no effect because when a machine is sold it carries the implied right to use. On the other hand, no one other than the patentee would have the right to make and sell machines and products so that the right in the public, under this bill, to use such machines or products would mean nothing because they would have to be obtained through the patent owner.

This bill represents a major and fundamental change in patent laws which have existed and operated satisfactorily for a century, and it is thought that it represents a retrogressive step since in effect it would eliminate process patents.

It is recommended that the bill be disapproved.

Patent Life: Under existing statutes, a patent is granted for a period of seventeen years, and the patentee is under no obligation to do anything with his patent or to permit any one else to operate under it. This is the theory upon which our patent laws are founded, namely, an exclusive monopoly for a relatively short period in return for the benefit which flows to the public from a disclosure of the invention and the right to use it upon the expiration of the patent.

It is proposed to alter this by H.R. 6864, under which a patent would be conclusively presumed to have been abandoned if the invention was not made, used, or sold for the uses and purposes for which it was intended within five years following the granting of the patent.

Anyone who has had anything to do with the development of inventions knows that in many instances, and commonly in connection with the most important inventions, a substantial period of years and a more or less great investment are necessary for the development of the in-

vention to a point at which it can be introduced to the public. This bill would throw every patent open five years after its grant if the invention had not been made, used, or sold. It is a step in the wrong direction because probably it would have a most adverse effect upon our patent system, and throughout the years the great weight of authority has been that our patent system has been integrally a part of our national economy, industrial status, and development, and that in large measure the industrial progress of this country has been traceable to the existence of a vigorous and sound patent system. To change it in the manner of this bill would be injudicious.

It is recommended that the bill be disapproved.

Assignments: Under the existing laws, the owner of a patent may assign it throughout the entire United States, or he may grant exclusive rights within a specified portion thereof. H.R. 6959 proposes to amend the statute (R.S. 4898) so that exclusive rights would be restricted to the *entire* United States. If this bill were enacted into law, the conveyance of exclusive rights for a specified part of the United States would be eliminated. From the standpoint of many industries, this might be quite objectionable.

Because of the objections to the foregoing bill, there was introduced another one, H.R. 4185, which would leave the present statute in its existing form but would provide that the exclusive manufacturing right or the exclusive selling right, or both, of a grantee in a specified territory less than the whole country should enjoy his right exclusively in the territory covered by his grant. This also might seriously interfere with the normal course of business.

It is recommended that both bills be disapproved.

Suits against the United States: S. 2382, in the Senate, aims to amend the statute under which the government may be sued in the Court of Claims, for instance, for patent infringement, to provide that every claim against the United States brought in the Court of Claims shall be barred unless filed within six years of the accrual of the claim, and that where the claim is for *compensation* it must be filed within *one year* of such accrual unless the plaintiff waives interest for the period between a year following the accrual of the claim and the time of filing the suit. A similar bill, H.R. 5819, is pending in the House of Representatives.

In the Court of Claims, the practice is to allow interest from the date upon which the government's trespass began up to the date of payment; in some claims pursued in that court, the interest allowance substantially exceeded the award itself. Because of delays in the prosecution of actions in the Court of Claims, the Court has attempted to minimize the interest item by compelling the plaintiff, where delay appears certain, either to waive the additional allowance measured by interest or to proceed to trial at once. This would appear to take care of the matter satisfactorily. Also, inquiry develops the fact that in all probability the delays in the Court of Claims are not wholly traceable to the plaintiffs. It appears that in large measure, at least, the delays are due to those of the government itself in defending the suits. Rather than to pass this act, which might have a most inequitable effect under various circumstances, it is felt that it would be better for the Court to proceed as it has done, and for the Attorney General's office to expedite the disposition of these suits.

Disapproval of this bill is recommended.

Miscellaneous Bills

Re Patent Solicitors: S. 477, a bill passed by the Senate, makes it a punishable misdemeanor for any person who has not been admitted to practice before the Patent Office, or who has been disbarred from such practice and not reinstated, to hold himself out as a patent solicitor, patent agent, patent attorney, or otherwise authorized to represent applicants for patent in their business before the Patent Office. There is a corresponding bill in the House, H.R. 1654.

Both of these bills have wide approval in principle, not only by bar associations, but also by scientific and technical organizations, for obvious reasons.

It is recommended that these bills be approved.

Secrecy in the Patent Office: H. R. 6447 aims to protect the right of secrecy in pending applications for patent by providing that no portion of any record relating to any application for patent pending before the Patent Office shall be furnished or disclosed to any person other than the applicant or one having an interest in the application, or their appointees, except under certain specified court orders.

The purpose or history of this bill is not clear, but it seems to be both ineptly drawn and unneeded. Under it, a party to an interference would be unable to examine his opponent's file, which would be an absurd result because it would be impossible to conduct an interference without such an examination. The bill seems to be unnecessary, in any event, because patent applications are at present maintained absolutely secret and no unauthorized person may gain access to them.

Under the circumstances it is recommended that the bill be disapproved.

Indigent Patentees: H.R. 1666 is a bill before the House that provides that the Commissioner of Patents shall appoint attorneys to represent indigent patentees in bringing or defending actions in the federal courts.

The same bill has been before previous Congresses, and has been disapproved by the American Bar Association. Essentially, the reasons for its disapproval were that the federal statutes already provide for proceedings *in forma pauperis*, and a pauper patentee is entitled to the same privileges as any other pauper, but certainly should not be entitled to greater privileges such as this bill would provide. Also, the Commissioner of Patents would be called upon to make investigations and to undertake other matters while he has no staff, appropriation, or facilities for undertaking these things. The burden of making the investigations necessary under the bill should not be upon the Commissioner of Patents; particularly, the questions of validity and infringement of patents previously granted by the Patent Office, necessary under this act, should be divorced from the Patent Office.

It is felt that the Patent Office can function more efficiently and better in the public interest if it continues to act only in connection with the granting of patents.

Finally, the bill provides for a certificate which would give the pauper an unfair advantage of having an official decision of merit obtained *ex parte*, which might be disadvantageous to his nonpauper opponent, who has no way of obtaining a similar certificate.

It is recommended that this bill be disapproved.

For the foregoing reasons, the Committee recommends

the adoption of the report, with appropriate notification to the proper Committees of Congress as follows:

Bills Approved

S. 475: Court of Patent Appeals
H.R. 5636: Court of Patent Appeals, if amended to conform to S. 475
S. 477, H.R. 1654: Fraudulent Patent Soliciting

Bills Not Approved

S. 2382, H.R. 5819: Court of Claims
H.R. 1666: Indigent Patentees
H.R. 4185: *re* Assignments
H.R. 5855: Court of Patent Appeals
H.R. 6447: Secrecy in the Patent Office
H.R. 6864: Five-Year Working
H.R. 6959: *re* Assignments
H.R. 7457: Clayton Act
H.R. 7811: *re* Patent Grant
H.R. 7851: Product of Process
H.R. 8508: Labor-Saving Devices
H.R. 9259: Compulsory License

—JOHN C. HOSTETTER, FRANK H. RIDDLE, and FULTON B. FLICK, *Chairman*

NO PATENT LEGISLATION THIS SESSION*

Since the copy for the March issue of the American Engineering Council Bulletin was prepared, Congressman McFarlane and his associates have substituted H.R. 10068 for H.R. 9259 and thus changed many of the implications of current patent legislation. Moreover, Council's staff is reliably informed that no compulsory licensing of patents or similar threat to change radically patent regulations is in the schedule of bills to come up for action during this Session of Congress. In fact, proponents of such legislation are no longer in a mood to fight for it.

Congressman McFarlane's new bill, H.R. 10068, simply proposes to amend Section 35 of the Revised Statutes to provide for compulsory license where there is satisfactory evidence that a patent is not being used after the expiration of five years from date of issuance. In other words, the inventor would have an absolutely exclusive right to his patent for five years, but would have to put it into use within a period of five years to maintain all of the rights originally granted under his patent to the exclusive use of his invention or discovery.

As a basis for the equitable determination of royalties where licenses might be ordered under this revision of the statute, provision is made for filing an itemized statement with applications for patents, setting forth the time and expense devoted to the development of the patent together with an appraisal of the intrinsic value of the invention or discovery, insofar as such an estimate is possible at that time.

In the absence of a positive threat to pass legislation interfering with the rights of inventors to control and dispose of their discoveries, Council is not appearing before the Subcommittee of the Patents Committee of the House of Representatives regarding pending legislation. It is believed to be more effective for the staff to supply sponsors of such patent legislation with factual information indicating the true nature of present conditions, on the premise that such knowledge will serve to protect the public against any act which would restrict the freedom of the owners of patents to use them constructively under present law.

—FREDERICK M. FEIKER, *Executive Secretary*

* American Engineering Council news release, April 1, 1938.

REPORT OF COMMITTEE ON DUST HAZARDS*

The Committee as appointed by the President is as follows: F. C. Flint, *Chairman*, Hazel-Atlas Glass Co., Zanesville, Ohio; Edward Schramm, Onondaga Pottery Co., Syracuse, N. Y.; J. C. Hostetter, Hartford-Empire Co., Hartford, Conn.; and L. H. Milligan, Norton Co., Worcester, Mass.

There have been no formal meetings of the Committee, for it was set up primarily to take care of any contacts necessary for the Society. The Chairman has attended the meetings of the Air Hygiene Foundation at Mellon Institute. There could be no formal report on this to the members because the Society does not belong. The work of the Air Hygiene Foundation, however, is important and is developing valuable information and stability in the consideration of dust hazards. I would not recommend that we join the Foundation at the fees which they would normally have to charge, though we can continue to stand by to help them in anything that we are capable of doing as an organization.

This year the Committee opened up the subject of ceramics in the All-Ohio Safety Congress, which, inasmuch as Ohio is one of the key states in ceramics, should be a portion of their consideration. This Safety Congress is an important factor in safety work in Ohio.

I would recommend that the Society endeavor to get representation on the Advisory Committee of the New York State Compensation Board, where work is to be taken up on dust hazards in ceramic work. Such representation should be from a New York member.

—F. C. FLINT, *Chairman*

* Dated March 19, 1938.

EDITOR'S NOTE: The Society is actively coöperating with the Air Hygiene Foundation and is publishing reports of the Foundation as they are issued. For the latest reports see *Bull. Amer. Ceram. Soc.*, **17** [1] 39–40 (1938) and **17** [4] 193 (1938).

REPORT OF STRUCTURAL CLAY PRODUCTS RESEARCH FOUNDATION*

A conference was held at the University of Illinois, with A. I. Andrews, representing the American Ceramic Society, and C. W. Parmelee and the writer (both Trustees of the Foundation), representing the Structural Clay Products Research Foundation, at the request of Henry C. Kleymeyer, President of the Foundation.

The Foundation was originally organized in 1931 under the guidance of General Edward Orton, Jr., at that time President of the American Ceramic Society, and was affiliated with the Society from the beginning. In 1935, it was reorganized in conference with J. M. McKinley, President, and Ross C. Purdy, Secretary, of the Society. The revised By-Laws of the Foundation were approved by the Board of Trustees of the American Ceramic Society on June 7, 1935, and were published.[1]

The affiliation of the Foundation with the Society is maintained by the Chairmen of the Structural Clay Products, Terra Cotta, and Materials and Equipment Divisions, who are *ex-officio* trustees of the Foundation. The other six trustees of the Foundation are elected, two each year, for a term of three years, by the Board of Trustees of the Foundation.

The Research Program of the Foundation is under the supervision of our Committee on Research Committees, of which C. W. Parmelee is Chairman, and of which the representatives of the Structural Clay Products, Terra Cotta, and Materials and Equipment Divisions on the Standing Research Committee of the Society are *ex-officio* members. There are sixteen research committees dealing with various phases of the production, properties, and uses of structural clay products.[2] These Committees have issued twenty-three *Bulletins* giving the results of their research work.[2] These *Bulletins* deal with drying, firing, clay winning, and preparation, dry-press and stiff-mud processing, power consumption, shipping of clay products, and reinforced clay masonry.

The Research Program of the Foundation has been financed by contributions from various individuals and organizations.

The earlier *Bulletins* were published by the Foundation, and the last seven *Bulletins* were published by the Society, in accordance with the revised By-Laws of the Foundation, as approved by the Board of Trustees of the Society.

The economic collapse of our country in 1932 especially affected the structural clay products industry. This caused the Foundation to lose more than $1100 on contribution pledges and prevented the Foundation from paying all the indebtedness incurred prior to that time. The remainder of this old indebtedness, amounting to $381.69, is covered by itemized statements submitted herewith, and was incurred before the Society took over the publication of the *Bulletins* of the Foundation. The contribution from the American Ceramic Society of this amount enables the Foundation to clear up all this old indebtedness and is greatly appreciated by the Trustees. This contribution involves no liability on the part of the Society.

Whenever conditions in the structural clay products industry improve sufficiently so that those interested in this industry can support it, the research program of the Foundation should be resumed. In the meantime, the Trustees recommend that the organization of the Foundation be continued as at present.

—Douglas F. Stevens, *Secretary-Treasurer*

* Received March 7, 1938.

[1] *Bull. Amer. Ceram. Soc.*, **14** [6] 212–13 (1935).

[2] *Ibid.*, **16** [5] 213–14 (1937).

REPORT OF COMMITTEE ON GEOLOGICAL SURVEYS*

During the past year the Committee on Geological Surveys has set for itself the task of attempting to draw up a set of definitions of the various types of clay that are used in the ceramic industries.

After correspondence with the members of the Committee, the Chairman drew up a list of some forty names and sent these to the members of the Committee with the request that they formulate definitions. When these were received, an effort was made to combine them and thus form definitions that would be satisfactory to as many members of the Committee as possible.

In addition, the Chairman has sent a number of inquiries to ceramists around the country inviting their opinions.

While the Committee is well along in the work on the first list, which involves ceramic definitions of raw clays, the final report will not be ready in time for submission at the Meeting. As might be supposed, one definition which has caused considerable trouble is that of "clay."

Inasmuch as some of the definitions refer to refractory clays, the coöperation of the A.S.T.M. and A.R.I. Committees on these materials will be sought.

If it is not possible to get the report completed in time for the Meeting, it will be submitted to the Secretary for the *Bulletin* at the earliest possible date thereafter.

—H. Ries, *Chairman*

* Dated March 18, 1938.

REPORT OF JOINT COMMITTEE ON ILLUMINATING GLASSES*

The Joint Committee on Illuminating Glasses has concerned itself during the past year with the evaluation and definition of the diffusing power of light-scattering media. A series of glasses of the controlled opal type has been prepared for study by several independent laboratories. These cover an extremely wide range of diffusing powers. It is hoped that some of them may be adopted as permanent standards for evaluating the properties of diffusing media in general.

The Halbertsma and German Committee methods of

* Dated March 22, 1938.

determining diffusing power have been studied and discussed by the group.

An independent method, based on comparisons of the integrated areas under brightness distribution curves, has been suggested and is being considered both from the standpoint of laboratory technique and also from that of the utility of the resulting data for engineering applications.

—H. H. BLAU, *Chairman*

REPORT OF ENAMEL DIVISION RESEARCH COMMITTEE

The Division chairman, Frank R. Porter, had a definite project which he asked the Research Committee to undertake during the past year, namely, a study of the nickel-dip process. It was originally planned that this study would be largely of a direct industrial nature, with the concentrations, temperatures, and other conditions being varied, and the results correlated with the quality of the enamel coatings.

F. R. Porter, W. H. Pfeiffer, and B. T. Sweely consented to act on the Research Committee. Mr. Pfeiffer submitted a tentative program of investigation, and Mr. Sweely submitted comments and additional suggestions.

W. Blum, Chief of the Electrochemistry Section of the National Bureau of Standards, was asked to comment on the proposed program and suggested that some preliminary experiments would be necessary before definite recommendations could be made. Through the courtesy of G. E. F. Lundell, Chief of the Chemistry Division of the Bureau, C. J. Rodden of the Bureau staff was assigned to assist in some preliminary experiments. The results indicated that elementary questions, such as the form in which nickel is deposited in the nickel-dip process and the mechanism by which it is deposited, are not at present answerable. Dr. Blum recommended that a really fruitful practical study should be preceded by a research into the fundamentals that are being dealt with. Chairman Porter suggested that a Fellowship for such a research be established at the National Bureau of Standards through the American Ceramic Society. He has consulted the other committee members and the President of the Society, Robert B. Sosman, all of whom agree as to the wisdom of the suggested procedure. Although a general business recession has made the time appear inopportune for financing the Fellowship immediately, Mr. Porter reports that he believes the necessary funds can be raised when business improves. Your Committee recommends that its successors give consideration to the advisability of furthering this project.

—W. N. HARRISON, *Chairman*

REPORT OF SUGGESTIONS TO COMMITTEE D-3, A.S.T.M., CONCERNING IMPURITIES IN GASEOUS FUELS

As the official representative of the American Ceramic Society, a technical organization representing consumer interest in the ceramic industry, I would like to recommend to the Committee as a whole and, particularly, to the Subcommittee D-3-V on Determinations of Impurities in Gaseous Fuels, that they establish standard methods for determining sulfur impurities more explicitly than have been proposed so far, wherein determinations of sulfur impurities have been limited to hydrogen sulfide and to total sulfur. Ceramic users of gaseous fuels would be interested in knowing the nature and quantity of the sulfur compounds now grouped under the heading of total sulfur. Ceramic users would be interested in knowing whether this total sulfur consists of carbon bisulfide, carbon oxysulfide, sulfur dioxide, sulfur trioxide, the organic sulfur compounds known as mercaptans, or thiophene.

I am not proposing that companies must furnish this information to prospective users or customers, but we believe that the best interests of both the supplier of the gaseous fuels and the consumer, in the long run, will be served if standard methods of determination of these other gaseous sulfur impurities are developed and adopted. I believe the development and adoption of these standard methods will occasionally avoid imprudent investments on the part of consumers and public utilities if the information obtained from these determinations can be intelligently applied to problems in the ceramic industries involved when considering application of gaseous fuel to their heat-treating furnaces. By the same token, I believe that additional customers for gaseous fuels can be developed if public utilities can furnish to prospective customers the sulfur impurities determined as explicitly as we are now recommending. It is not contemplated that the distribution of gas to all customers would be made on any more exacting basis than is now required by the various regulatory commissions if the methods and determinations we ask for be standardized and adopted.

Your Committee's attention is called to a report, published in the *Proceedings of the American Gas Association* for 1931 on page 1082, entitled "Process for Reduction of Organic Sulphur in City Gas" by E. J. Menery, Peoples Gas Co., Glassboro, N. J. Your Committee's attention is also called to the work now being done by the Committee on Gas Conditioning of the American Gas Association of which O. S. Hegerman, 420 Lexington Ave., New York, is chairman, where we understand that a project is in progress on organic sulfur removal which will soon be reported.

The American Ceramic Society is canvassing its more than 2000 members through its publication, known as *The Bulletin*, for further information on this subject and particularly trying to bring out the effects on ceramic products of the different kinds of sulfur impurities in gaseous fuels. If this canvass reveals simple and accurate methods for the determinations of these impurities, I shall be glad to relay this information to the Committee for their information and suitable action.

Respectfully submitted to Committee D-3 for appropriate action.

—C. H. PARMELEE

SECRETARY'S MESSAGE

This Society is active in gathering information on standards and in promoting the development of standards, not only regarding materials but with methods and equipment; practically all of this is invested in the various committees of the American Society for Testing Materials. This activity on standards, on the part of the committees of this Society, invested in A.S.T.M., is like unto a lot of its activi-

ties, the fruition of which appears only in the publications of other organizations.

It may be unusual in association work, but the facts are that for many years this Society has not sought the domination of all art, science, and technology activities in ceramics. It has sought deliberately the opportunity to promote these through every available agency, such as other technical, trade, and engineering societies, national and state organizations, government, state, and semipublic research institutions, colleges, high schools, and other educational organizations, and through women's clubs and all sorts of technical clubs. This philosophy is based upon the theory that the broader and more decentralized the activities in ceramic arts, science, and technology, the more certainly and more rapidly will advances in ceramics be made.

This Society is publishing three journals each month, the *Journal*, *Ceramic Abstracts*, and *The Bulletin*, and yet the Society is not primarily in the publishing business and is using these three publications only as working tools to promote the objectives of the Society. In the same manner, all of its meetings (annual, divisional, sectional, and student) are not for the purpose of holding meetings but for advancing the arts, science, and technology of ceramics.

It has been thought that this Society could best develop standards and specifications through such organizations as the A.S.T.M., the American Standards Association, and other agencies that have broader contacts than this Society alone can obtain. The Society is anxious for its work to have the largest possible application and understanding and this is obtainable through contact with all of these other agencies.

REPORT OF COMMITTEE ON THE NEW YORK WORLD'S FAIR, 1939*

On Friday, March 11, a meeting was held at the Empire State Club in New York to discuss the matter of a general ceramic exhibit at the World's Fair. Those present representing the New York World's Fair were Mr. Mermay, exhibits and concessions; Mr. Cahill, art; Mr. Kohn, chairman of theme; Dr. Wendt, science; and Louise Bonney, theme.

Representing the American Ceramic Society were R. B. Sosman, President; V. V. Kelsey, Vice-President; and L. E. Barringer, trustee representative of the Art Division.

Representatives of industry were F. R. Valentine, P. C. Olsen, George Simcoe, P. D. Helser, Mr. Aitkin; universities, G. H. Brown; and publications, J. T. Ogden, H. V. Kaeppel, and Mr. Smith. Mr. Barringer acted in the capacity of temporary chairman.

The officials representing the World's Fair described a building that will be erected by the World's Fair which has 21,000 square feet of floor area. There is a large portico to be built in front of this building. It can be designated "Ceramics Art Building" or some other suitable name.

The World's Fair Association desires to rent this building at $14.00 per square foot. Out of a total area of 21,000 square feet they expect to rent a net of 12,000 square feet, which amounts to $168,000 for rental. Thus the ratio of exhibits space to total floor area is 57 to 43%.

Those present representing industry, universities, and publications were favorable to the idea of trying to have an attractive and suitable ceramic exhibit.

Miss Bonney pointed out that many of the European countries would have elaborate ceramic displays in their respective buildings. It would be rather disappointing if American ceramic manufacturers failed to exhibit their wares properly.

No definite action was taken at this meeting.

On March 14, a second meeting was held at the Empire State Club. Those present were Messrs. Kohn, Wendt, Baker, McLaughlin, and Miss Bonney, representing the Fair Association, and Messrs. Olsen, Helser, and Kelsey, representing the ceramic industry.

At this meeting, V. V. Kelsey proposed that the Fair officials contact the ceramic trade associations to see whether or not sufficient funds can be raised to be contributed by the members of the various trade associations to underwrite this proposition. He made clear to the Fair representatives that this was not a matter for the American Ceramic Society to finance; therefore, the Society is not committed in any respect.

If the project goes through, the Society naturally will be called upon to contribute suggestions as to the exhibits.

The Fair officials desire that we set up three exhibits, which will be "theme" exhibits, portraying the development of ceramics and showing its importance in connection with our daily lives. One of these exhibits would be the pottery theme, which would include whiteware, terra cotta, structural clay products, etc.; the second theme would be devoted to glass; the third theme to the porcelain enamel industry. This plan tends to correlate a number of the important branches of the ceramic industries.

—V. V. KELSEY

* Received March 16, 1938.

ANNUAL REPORT OF COMMITTEE ON DIVISIONS AND SECTIONS*

The minutes of the meeting of the Committee of Divisions and Sections held March 30, 1938, are submitted herewith. This meeting was designed to bring together the President, President-Elect, Division Chairmen, and Chairmen-Elect, as well as the Chairmen of the various Sections for the following purposes:

(1) To discuss the possibility of the parent Society allocating funds to Sections for the promotion of greater activity and to bring to the Sections speakers not otherwise obtainable by that Section. It is understood that By-Laws prohibit the collection of dues in sufficient amount to do this. It was agreed that this matter should be considered by the Board.

M. C. Shaw suggested and is developing the idea of a

* Dated March 31, 1938.

"clearing house" which would communicate with Section Chairmen with a view eventually of being able to make available to Sections speakers who may be in their vicinity or speakers who may have special topics for presentation.

In connection with this work, it was suggested that the office of the General Secretary be requested to prepare a list of Section meeting dates so that Dr. Shaw could have them in case he may learn of such a speaker being available to certain Sections.

It was further suggested that it might be possible for the office of the General Secretary to use its facilities in sending out Section notices to Local Section mailing lists for their meetings as this is generally a rather expensive item for the Local Section. This may not be practicable in the case of distant Sections.

(2) The matter of the merging of the Terra Cotta Division with the Structural Clay Products Division was discussed and was so recommended by the Committee. The matter of the formation of a Division of Physical Chemistry was recommended, the need being pointed out for such a group where papers of general scientific interest can be properly presented and discussed.

(3) Student activities at Annual Meetings were discussed but no recommendations can be made at this time. The Society's future potential membership lies in the student bodies and it might be possible (*a*) to allow students from various schools to present papers in a meeting of their own at the Annual Meeting, or (*b*) to present an annual prize for the senior student doing the best research, allowing that student to present his work at one of our Meetings. The Committee on Awards would automatically handle this.

The general idea will be developed among the schools before any recommendation can be made, but the Committee believes that student interest in the Society should be stimulated. Mr. Poste has in his possession the Georgia School of Technology Student Branch Charter and will present it in the near future.

—H. M. KRANER, *Chairman*

SECRETARY'S MESSAGE

WHY REGISTRATION FEES AT ANNUAL MEETINGS

With unusual frankness, our members and others interested are told in *The Bulletin* the facts, financial and otherwise, concerning this Society. Financial statements of Annual Meeting expenses and incomes have been published. Because a few have asked what is done with money received as registration fees, the account for the 1938 Meeting is here given in detail.[1]

INCOME AND EXPENSES—1938 MEETING

Expenses		
Cuts for publicity	$ 42.44	
Postage	214.35	
Travel to New Orleans prior to Meeting	150.00	
Telegrams	80.80	
Printing announcements	54.59	
Ralph Grim travel expenses	50.00	
Mr. Purdy and Lois Turner travel expenses	100.00	
Railroad expense for Staff (3 members)	193.00	
Printing registration cards	30.14	
16 lantern slides Endell paper	8.00	
Expenses at hotel (Mr. Purdy and Staff)	138.87	
Students' dinner	156.00	
Entertainment	253.50	
Lantern operators	183.50	
Rental on lanterns	117.50	
Chalk and paper clips	5.85	
Printed inserts	14.75	
Printing programs	727.70	
Preprints	94.32	
Reporting Meeting	106.80	
Service charges	10.00	
Express on packages from New Orleans	7.83	
	$2739.94	
Income		
Registration income	$1445.50	
Profit from Country Club	8.44	1453.94
		Loss $1286.00
Fellow Charges		
Paul Kerr travel expenses	$ 75.00	
Orton slides	19.16	
Reporting at Meeting	35.60	
Orton dinner	25.38	$ 155.14

All of the Meeting affairs, social, business, and technical, on this occasion (as they were last year) were financed by registration fees plus appropriations from the Society's general fund. Not one cent of contribution was solicited locally and no local money used. This is as it should be.

This Society, through its Board of Trustees, has the policy of being independent of local committee control of policies and schedules. No entertainment or Meeting expense will be incurred which can not be paid for by the Society. The local committees, where Meetings are held, are appointed by the Board of Trustees and serve under its direction.

The American Ceramic Society has held several general and Division meetings jointly with other Associations, but always with results unsatisfactory to both organizations because of conflict in policies and practices. Such joint meetings in the future will be discouraged. Our members will conduct and finance their own meetings under the direction of the Board of Trustees.

[1] For a statement of the income and expenses of the Thirty-Ninth Annual Meeting held in New York, 1937, see *Bull. Amer. Ceram. Soc.*, **16** [5] 205 (1937).

CORPORATION MEMBERS ARE ESSENTIAL TO CONTINUE THIS COÖPERATIVE PROMOTION OF CERAMIC ART AND SCIENCE

RECESSION?

Not More Than Annually When Cut-Offs Are Made Due to Non-Payment of Dues

Date of Record	Members Paid Personal	Members Paid Corporation	Deferred	Subscriptions	Monthly Sales	Total Circulation
December 20, 1936	1452	196				
December 22, 1937	1713	220	12	523	220	2688
January 22, 1938	1712	220	12	530	220	2694
February 18, 1938	1728	217	15	540	220	2720
March 18, 1938	1770	216	10	513	220	2729
April 18, 1938	1635	205	60	527	220	2647

Down 85 Personal and 11 Corporations

The American Ceramic Society is wholly and strictly a coöperative educational, scientific, and technical organization, and it does not interest itself and does not devote any space in its publication or at its General, Divisional, Sectional, or Student Branch meetings to questions of trade, tariff, or labor; nor does it lobby in the interest of the ceramic industries in legislatures.

The programs presented at the Fortieth Annual Meeting, held the week of March 27, 1938, in New Orleans, were exclusively scientific and technical.

The Committee reports are strictly educational and technical.

The *Journal*, issued the first of each month, is devoted to reports of scientific research of interest to ceramists.

The *Ceramic Abstracts*, which is under the same cover with the *Journal* but with its own pagination, covers the world-wide published information, other than trade, traffic, and labor, of interest to ceramists.

The *Bulletin*, issued on the fifteenth of each month, is devoted to papers on applied ceramic research and to promotion of technical activities of interest to ceramists both within and without the Society. This *Bulletin* never carries trade notes. It is limited strictly to the objectives of the Society, the promoting of Ceramic Arts, Science, and Technology. It (as are the two other publications) is compiled, edited, and managed in all details by the officers and committeemen of the Society without compensation. The only persons receiving money compensation are the General Secretary and eight young women who are employed by the Board of Trustees.

Memberships in the Society are Honorary, Life, Personal, Student, and Corporation. The Corporation Memberships are for the purpose of giving financial support. The Corporation Member fee is $25, minimum, annually. Corporation fees are not assessments based on plant capacity or on sales.

Universities giving ceramic instruction and the several geological surveys, federal and state, as well as the federal Bureaus of Mines and Standards, the semipublic research institutes, such as Mellon in Pittsburgh and Battelle in Columbus, are engaged in ceramic education and research largely as a result of the promotional activities of the American Ceramic Society.

There are ceramic institutes such as the Refractories and Porcelain Enamel; also societies and associations that are primarily trade in their activities but which do finance ceramic research. With these trade organizations, this Society collaborates but only in matters of Ceramic Art, Science, and Technology research.

The American Ceramic Society *is* strictly an educational and scientific organization.

ACTIVITIES OF THE SOCIETY

REPORT ON GENERAL MEMBERSHIP*

	Paid Membership Gained		
	Personal	Corporation	Total
December 1936 to December 1937	261	24	285

Additional gains up to February 18, 1938, minus losses of nonrenewals, show a net gain of 12.

Total memberships, February, 1938: 1945

The goal on membership is 3000 by 1940, which is possible if business revives as expected.

During 1937, a campaign was started by means of district chairmen and Division appointees to assist them. This campaign has not progressed as fast as desired, owing to difficulty of obtaining the names of the Division appointees. The plan is having mild success, however, and has apparently been responsible for about a dozen new members. The Chairman recommends continuance of this plan and also at least two letters per year to all members requesting membership activity.

The advantage of the district membership campaign is that it gives definite responsibility to various men in certain geographical areas. This responsibility is bound to result in positive effort.

—G. S. DIAMOND, *Chairman*

* Dated March 27, 1938.

NEW MEMBERS, MARCH 20 TO APRIL 20

Corporation

NATIONAL INDUSTRIAL SAND ASSN., V. P. Ahearn (voter), 951 Munsey Bldg., Washington, D. C.

Personal

CHAMBERS, GORDON H., 1609 Summer St., Philadelphia, Pa.; vice-president, Foote Mineral Co.

*COX, SAMUEL F., 4337 Fifth Ave., Pittsburgh, Pa.; director, Pittsburgh Plate Glass Co.

*DAILEY, E. W., 917 Walnut St., Chillicothe, Mo.

FRANCIS, MARCUS, British Pottery Research Assn., Stoke-on-Trent, England; director of research.

GARBISCH, NORBERT S., Butler Savings & Trust Bldg., Butler, Pa.; president, Garco Products, Inc.

GHERING, LEONARD G., Box 847, Butler, Pa.; research assistant, Glass Container Assn.

*JUNG, PHILIP H., 314 Washington St., Huntington, Pa.; chemical and ceramic engineer.

LAIRD, STANLEY M., 5400 Stanton Ave., Pittsburgh, Pa.; technical superintendent, Glenshaw Glass Co., Glenshaw, Pa.

RAPP, GEORGE M., 2117 Grant Bldg., Pittsburgh, Pa.; chief engineer, Pittsburgh-Corning Corp.

ROSENBERG, ELMER E., 135 West Side Ave., Jersey City, N. J.; mold engineer, Metro Glass Bottle Co.

SCHROTER, G. AUSTIN, 315 West Fifth St., Los Angeles, Calif.; manager, Exploration Filtrol Corp.

*SPOONER, E. C. R., National Smelting Co., Ltd., Avonmouth, Glos., England.

Student

BECKEMEYER, HARRY J., University of Illinois.

HALDY, NORMAN L., Ohio State University.

STEARNS, LEONARD, Massachusetts Inst. of Technology.

MEMBERSHIP WORKERS' RECORD

Corporation

F. C. Flint	1

Personal

C. E. Bales	1	F. W. Preston	1
Tom Curtis	1	E. Ward Tillotson	1
J. W. Hepplewhite	1	F. S. Worthington	1
J. R. Kauffman	1	Office	5

Student

A. I. Andrews	1	A. S. Watts	1
F. H. Norton	1		
		Grand Total	**16**

* Indicates former member of the Society rejoining for 1938.

ROSTER CHANGES DURING APRIL*

Corporation

AMERICAN NEPHELINE CORP., H. R. Deeth (voter), 361 Boxart St., Rochester, N. Y. (Canadian Nepheline Ltd., Lakefield, Ont., Canada)

Personal

AUSTIN, J. L., Carborundum Co., Niagara Falls, N. Y. (formerly in name of Percy W. Burdick)

BARTLETT, ADELBERT M., R. Guastavino Co., 40 Court St., Boston, Mass. (Woburn, Mass.)

BETZ, GEORGE C., Star Porcelain Co., Trenton, N. J. (Philadelphia, Pa.)

CARPENTER, J. HALL, 262 W. Borden Ave., Syracuse, N. Y. (Atlanta, Ga.)

EATHERTON, C. Z., R.F.D. 1, Mt. Pleasant, Pa. (South Greensburg, Pa.)

EDDY, MAXSON A., Kimble Glass Co., Vineland, N. J. (Terre Haute, Ind.)

GERSTENSCHLAGER, V., JR., Babcock & Wilcox Co., Augusta, Ga. (formerly in name of J. H. Carmichael)

GREENSTREET, EDWARD C., 2810 Southern Ave., Baltimore, Md. (Cicero, Ill.)

HAMMOND, WALTER E., Golding-Keene Co., Keene, N. H. (Toecane, N. C.)

HEUBACH, A. R., Hoesel, near Düsseldorf, Germany. (Ratingen, Germany)

KING, JOHN U., JR., 1918 Nun St., Wilmington, N. C. (Cleveland, Ohio)

KLEIN, GORDON, 509 N. Jefferson St., New Castle, Pa. (East Liverpool, Ohio)

MOORE, LYMAN H., A. P. Green Fire Brick Co., Mexico, Mo. (Oakland, Calif.)

* Address in parentheses is the former address.

NESMITH, LEONARD C., 3018 Evelyn St., La Crescenta, Calif. (Glendale, Calif.)

NEWHOUSE, HENRY, 965 Stewart Ave., Columbus, Ohio. (Washington, D. C.)

PRESSWOOD, COLIN, St. Kitts, Boston Spa, near Wetherby, Yorks, England. (Bletchley, Bucks, England)

SCHOTTLAND, A. H., Standard Bent Glass Co., Butler, Pa. (Blairsville, Pa.)

SIXT, LAWRENCE F., 1213 Albert St., New Castle, Pa. (St. Louis, Mo.)

VALENTINE, FRANK R., Toms River, N. J. (Woodbridge, N. J.)

THE CANADIAN CERAMIC SOCIETY SENDS GREETINGS

I am instructed by the president of the Canadian Ceramic Society, Henry D. McLaren, to extend to your Society our best wishes on your attaining forty years of activity in the ceramic field.

It is our earnest hope that the American Ceramic Society may continue to prosper and carry on its excellent work in the cause of ceramics as it has done for the past forty years under the able leadership of an outstanding list of executive officers.

—GORDON C. KEITH, *Secretary*

NECROLOGY

JAMES G. BARBOUR*

James G. Barbour, aged 72, secretary and treasurer of the Metropolitan Paving Brick Company, Canton, Ohio, died in Orlando, Fla., from a heart attack.

Funeral services for Mr. Barbour were conducted March 3, 1938. Among the pall-bearers were Messrs. Blair, Renkert, and Keplinger, of the Metropolitan Paving Brick Company, with which he was so long identified.

Mr. Barbour came to Canton 34 years ago to take a position with the Canton Brick Company and remained with that Company until it was taken over by the Metropolitan Company, when he was named secretary and treasurer.

Born in Pittsburgh, he attended the University of Pittsburgh. After becoming a brick salesman, he attended law school at night and was admitted to the Pennsylvania Bar.

Mr. Barbour was considered one of the leaders in the brick industry and his business connections extended to all parts of the country.

* Excerpts from National Paving Brick Assn., *Business Rev.*, No. 3, April 2, 1938.

LOCAL SECTIONS

NORTHERN CALIFORNIA SECTION

On March 21, 1938, forty-eight members of the Northern California Section enjoyed an excellent steak dinner at the German Restaurant, 600 Turk St., San Francisco.

After dinner, the members adjourned to the recently completed offices of the Gladding, McBean & Co. The following talks were then presented:

(1) "What Is Back of a Factory Order?" by E. E. Saunders, Gladding, McBean & Co.

(2) "Production of Required Pieces," by Graham E. Smith, N. Clark & Sons.

(3) "Production of Desired Colors," by George E. Sladek, Kraftile.

(1) Mr. Saunders discussed the various phases encountered in selling the prospective builder the idea of using terra cotta on the exterior of the proposed building. The need for full coöperation between the builder or architect and the terra cotta manufacturer was pointed out to make it possible to supply terra-cotta facing at a minimum cost. The necessity of forming new specifications for the placing of terra cotta or the more recent ceramic veneer was also emphasized.

(2) Mr. Smith started his discussion with the receipt of the order for terra cotta at the factory. The raw materials, batching, and tempering were discussed, and the making of the molds for the hand-made sections was described. Machine production of large sections was illustrated by typical examples, and driers of various types were suggested.

(3) Mr. Sladek said that color is of great importance, as this is the surface that causes the attention to be called to the particular piece. The method of testing the various raw materials in a glaze was described, the importance of the uniformity of color was discussed, and a method was given for the control of uniformity. Several types of shop practice and their influence upon the production of uniform colors were discussed.

The possibilities and responsibilities of the terra cotta manufacturer were summed up in the general discussion which followed the talks.

The attendance at the meetings of this recently organized Section is increasing, with the result that this part of California is becoming more ceramic-minded.

All members were pleased with the possibility of holding a meeting of the American Ceramic Society in the San Francisco area sometime during 1939.

—GEORGE A. PAGE, *Secretary*

PITTSBURGH SECTION

A meeting of the Pittsburgh Section was held Tuesday, April 12, 1938, in the auditorium of Mellon Institute. An illustrated lecture was given by W. J. Sutton of Alfred, N. Y. The subject of the lecture was "Manufacture of Porcelain near Tehwa, South China."

—C. L. THOMPSON, *Secretary*

CENTRAL OHIO SECTION

Members of the Central Ohio Section of the American Ceramic Society met at the O.S.U. Engineering Experiment Station on Thursday evening, March 10, 1938. G. A. Bole of the Engineering Experiment Station gave an informal talk on the work carried on at the Station. C. J. Koenig of the Experiment Station presented a motion picture of the mining and milling operations used for obtaining nepheline syenite. An inspection tour of the Experiment Station followed the talks.

The following officers were elected for 1938–1939: *Chairman*, H. Z. SCHOFIELD, O.S.U. Engineering Experiment Station; *Councillor*, J. L. CARRUTHERS, Ohio State University; *Secretary*, R. P. GRAHAM, Battelle Memorial Institute.

—R. P. GRAHAM, *Secretary*

PITTSBURGH SECTION

The officers of the Pittsburgh Section are as follows:

Chairman: D. G. BENNETT, Mellon Institute, Pittsburgh, Pa.

Vice-Chairman: W. C. RUECKEL, Koppers Construction Co., Pittsburgh, Pa.

Secretary: C. L. THOMPSON, Harbison-Walker Refractories Co., Pittsburgh, Pa.

Treasurer: J. W. HEPPLEWHITE, Edwin M. Knowles China Co., Newell, W. Va.

Councillor: F. A. HARVEY, Harbison-Walker Refractories Co., Pittsburgh, Pa.

Notices of each meeting are mailed to 250 persons in a radius of 150 miles of Pittsburgh. There are six meetings held each year, with an average attendance of 50 members. The dues are one dollar a year.

There were two outstanding meetings during the year, (1) when Walter Ford addressed the Section, and (2) when A. V. Bleininger spoke at a dinner meeting at the College Club.

The same problem is still with the Section regarding ues. The usual number (60 to 70) paid dues, which is low considering that such a large number of notices are sent out each month. This local Section is active, but is handicapped owing to the lack of funds.

During the past year, an excellent meeting place has been provided by Mellon Institute of which the Section members may be proud and for which they may thank the Staff of the Institute.

—EARL C. PETRIE, *Secretary*

ST. LOUIS SECTION

The spring meeting of the St. Louis Section of the American Ceramic Society was held at the Missouri School of Mines and Metallurgy, Rolla, Mo., on May 13, 1938.

The afternoon was spent in renewing friendships and in making a tour of inspection of buildings and laboratories of the Missouri School of Mines and Metallurgy and the Missouri Geological Survey. The tour was followed by a golf tournament.

Dinner was served at the Sinclair Pennant Tavern. All members of the University faculty, the staff of the U. S. Bureau of Mines and State Geological Survey, and students were invited to attend.

The technical meeting was held in the evening at the Experiment Station Building. The following papers were presented:

(1) "Microstructure of Fire Brick in Relation to Slag Attack in Glass Checkers," by W. L. FABIANIC, Owens-Illinois Glass Co., Alton, Ill.

(2) "Development and Operation of a Missouri Fire Clay Mine," by B. K. MILLER, A. P. Green Fire Brick Co., Mexico, Mo.

(3) "The Nature of Origin of Refractory Clays," by D. W. ROSS, Laclede-Christy Clay Products Co., St. Louis, Mo.

(4) "Ceramic Resources of the Southwestern Mississippi Valley," by W. M. WEIGEL, Missouri Pacific Lines, St. Louis, Mo.

—C. M. DODD, *Chairman*

MEMBERS OF STANDING COMMITTEES, 1938–1939

Executive Committee, Board of Trustees

V. V. KELSEY (*ex-officio*): 1403 Trenton Trust Bldg., Trenton, N. J.

R. B. SOSMAN: United States Steel Corp., Research Lab., Kearny, N. J.

C. E. BALES: Ironton Fire Brick Co., Ironton, Ohio

E. H. FRITZ: Westinghouse Electric & Mfg. Co., Derry, Pa.

F. C. FLINT: Hazel-Atlas Glass Co., Zanesville, Ohio

A. I. ANDREWS: Dept. of Ceramic Engineering, Univ. of Illinois, Urbana, Ill.

Finance Committee, Board of Trustees

C. E. BALES, *Chairman:* Ironton Fire Brick Co., Ironton, Ohio

J. L. CARRUTHERS: Ohio State University, Dept. of Ceramic Engineering, Columbus, Ohio

C. FORREST TEFFT: The Claycraft Co., Box 866, Columbus, Ohio

Committee on Rules

W. KEITH MCAFEE, *Chairman:* Universal Sanitary Mfg. Co., New Castle, Pa.

Committee on Publications

J. D. SULLIVAN, *Chairman:* Battelle Memorial Institute, Columbus, Ohio

E. DEF. CURTIS: Conestoga Pottery, Wayne, Pa.

E. E. MARBAKER: Mellon Institute, Pittsburgh, Pa.

W. W. WINSHIP: Thermal Syndicate, 12 East 46th Street, New York, N. Y.

R. C. PURDY (*ex-officio*): 2525 North High St., Columbus, Ohio

Committee on Membership

GRANT S. DIAMOND, *Chairman:* Electro Refractories & Alloys Corp., Lackawanna, N. Y.

Committee on Standards

J. W. WHITTEMORE, *Chairman:* Virginia Polytechnic Inst., Blacksburg, Va.

Committee on Sections and Divisions

H. M. KRANER, *Chairman:* Bethlehem Steel Co., Bethlehem, Pa.
T. S. CURTIS: Industrial Research Lab., Huntington Park, Calif.
REXFORD NEWCOMB, JR.: Industrial Publications, Inc., 59 East Van Buren St., Chicago, Ill.
E. P. POSTE: 309 McCallie Ave., Chattanooga, Tenn.
L. J. TROSTEL: General Refractories Co., Baltimore, Md.
W. R. MORGAN: Dept. of Ceramic Engineering, Univ. of Illinois, Urbana, Ill.

Committee on Research

G. H. MCINTYRE, *Chairman:* Ferro Enamel Corp., 4150 East 56th St., Cleveland, Ohio

Committee on Geological Surveys

H. RIES, *Chairman:* Cornell University, Ithaca, N. Y.
J. E. LAMAR: State Geology Div., Univ. of Illinois, Urbana, Ill.
O. C. RALSTON: U. S. Bureau of Mines, New Brunswick, N. J.
W. M. WEIGEL: Missouri Pacific Bldg., St. Louis, Mo.
HEWITT WILSON: Univ. of Washington, Seattle, Wash.

Committee on Data

D. G. BENNETT, *Chairman:* Mellon Institute, Pittsburgh, Pa.
F. P. HALL: Onondaga Pottery Co., Syracuse, N. Y.

Special Committee on Data for Geologists' Handbook

LOUIS NAVIAS, *Chairman:* General Electric Co., Schenectady, N. Y.

Committee on Ceramic Education

H. E. WHITE, *Chairman:* Lava Crucible Co., Zelienople, Pa. (Industry Member, 1 year)
N. W. TAYLOR: Dept. of Ceramics, Pennsylvania State College, State College, Pa. (Technology Member, 2 years)
F. H. RHEAD: Homer Laughlin China Co., Newell, W. Va. (Art Member, 3 years)
E. H. FRITZ: Westinghouse Electric & Mfg. Co., Derry, Pa. (Engineering Member, 4 years)
C. M. DODD: Missouri School of Mines & Metallurgy, Rolla, Mo. (Education Member, 5 years)

Committee on Industrial Management

W. KEITH MCAFEE, *Chairman:* Universal Sanitary Mfg. Co., New Castle, Pa.

Committee on Patents

F. B. FLICK, *Chairman:* 1706 First National Bank Bldg., Pittsburgh, Pa.
J. C. HOSTETTER: Hartford-Empire Co., Hartford, Conn.
F. H. RIDDLE: Ceramic Div., Champion Spark Plug Co., Detroit, Mich.

Committee on Film Library

H. E. SIMPSON, *Chairman:* Mellon Institute, Pittsburgh, Pa.
F. B. HOBART: Battelle Memorial Institute, Columbus, Ohio
R. C. PURDY

Committee on Dust Hazard

F. C. FLINT, *Chairman:* Hazel-Atlas Glass Co., Zanesville, Ohio
EDWARD SCHRAMM: Onondaga Pottery Co., Syracuse, N. Y.
F. A. HARVEY: Harbison-Walker Refractories Co., Pittsburgh, Pa.
L. H. MILLIGAN: Norton Company, Worcester, Mass.

Appointed Representatives for 1938–1939

American Association for the Advancement of Science

R. C. PURDY: 2525 North High St., Columbus, Ohio

American Foundrymen's Association

L. C. HEWITT, *Chairman:* Laclede-Christy Clay Products Co., Ambassador Bldg., St. Louis, Mo.
J. L. LOWE: 817 North Cedar Ave., Lansing, Mich.
G. A. BOLE: O.S.U. Engineering Experiment Station, Columbus, Ohio
PAUL BECHTNER: American Colloid Co., 363 W. Superior St., Chicago, Ill.

American Society for Testing Materials

Committee A-1 on Steel: H. F. STALEY, Metal & Thermit Corp., 120 Broadway, New York, N. Y.
Committee C-8 on Refractories: N. W. TAYLOR, Dept. of Ceramics, Pennsylvania State College, State College, Pa.
Committee C-11 on Gypsum: R. F. GELLER, National Bureau of Standards, Washington, D. C.
Committee C-14 on Glass and Glass Products: G. W. MOREY, Geophysical Laboratory, Washington, D. C.
Committee C-15 on Manufactured Masonry Units: R. L. CLARE, Federal Seaboard Terra Cotta Corp., Perth Amboy, N. J.
A. F. GREAVES-WALKER, Dept. of Ceramic Engineering, University of North Carolina, Raleigh, N. C.
Committee D-3 on Gaseous Fuels: C. H. PARMELEE, 210 Warham St., Syracuse, N. Y.
Committee D-9 on Electrical Insulating Materials: L. E. BARRINGER, General Electric Co., Schenectady, N. Y.

American Society of Mechanical Engineers

Petroleum Division: H. R. STRAIGHT, Straight Engineering Co., Adel, Iowa
Process Division: W. KEITH MCAFEE, Universal Sanitary Mfg. Co., New Castle, Pa.

American Standards Association

Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment (Project A-40): P. D. HELSER, General Ceramics Co., R.C.A. Bldg., 30 Rockefeller Plaza, New York, N. Y.
Sectional Committee on Recommended Practice for Brick Masonry (Project A-41): FREDERICK HEATH, JR., Colonial Clays, Inc., Worcester, Mass.
Sectional Committee on Insulators for Electric Power Lines (Project C-29): D. H. ROWLAND, Locke Insulator Corp., Baltimore, Md.

Sectional Committee on Classification of Coals (Project M-20): W. H. FULWEILER, 1600 Arch St., Philadelphia, Pa.

Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Project Z-10): L. E. BARRINGER, General Electric Co., Schenectady, N. Y.

Sectional Committee on Specifications for Sieves for Testing Purposes (Project Z-23): A. S. WATTS, Ohio State University, Columbus, Ohio

Sectional Committee on Specifications and Methods of Test for Safety Glass (Project Z-26): A. E. MARSHALL, 501 Fifth Avenue, New York, N. Y.; DONALD E. SHARP (*alternate*), Hartford-Empire Co., Hartford, Conn.

International Association for Testing Materials

S. M. PHELPS: Mellon Institute, Pittsburgh, Pa.

International Commission on Technology

J. C. HOSTETTER: Hartford-Empire Co., Hartford, Conn.

International Chemical Congress

ALEXANDER SILVERMAN: Dept. of Chemistry, Univ. of Pittsburgh, Pittsburgh, Pa.

Inter-Society Color Council

V. H. REMINGTON, *Chairman:* B. F. Drakenfeld & Co., Washington, Pa.

A. C. HARDY: Massachusetts Institute of Technology, Cambridge, Mass.

C. ROBERTSON: E. I. du Pont de Nemours & Co., R. & H. Chemicals Dept., Perth Amboy, N. J.

Illuminating Society and Luminous Glassware Guild

H. H. BLAU, *Chairman:* Corning Glass Works, Corning, N. Y.

R. A. MILLER: Pittsburgh Plate Glass Co., Pittsburgh, Pa.

R. R. SHIVELY: B. F. Drakenfeld & Co., Washington, Pa.

A. N. FINN: National Bureau of Standards, Washington, D. C.

National Research Council

Division of Geology and Geography: R. B. SOSMAN, U. S. Steel Corp., Research Lab., Kearny, N. J.

Division of Chemistry and Chemical Technology: ALEXANDER SILVERMAN, Dept. of Chemistry, University of Pittsburgh, Pittsburgh, Pa.

Orton Foundation Board

J. M. MCKINLEY: North American Refractories Co., Cleveland, Ohio

United States Department of Commerce, Division of Simplified Practice: Permanent Committee on Simplification of Variety and Standards of Vitrified Paving Brick

C. C. BLAIR: Metropolitan Paving Brick Co., Canton, Ohio

STUDENT BRANCH NEWS

UNIVERSITY OF ILLINOIS

Illini Ceramist for 1938

The *Illini Ceramist* for 1938, published by the Student Branch of the American Ceramic Society, has been issued. This is the second year that the ceramic students of the Engineering College at the University of Illinois have issued this year-book. The 1938 edition is dedicated to Dr. Ross C. Purdy, "First Instructor, Department of Ceramic Engineering, University of Illinois; General Secretary of the American Ceramic Society, *Creator of Its Present Structure;* Editor of the Publications of the American Ceramic Society; Author of Many Valuable Contributions to Ceramic Literature; and a Leader in Research for the Industry."

The year-book contains forty pages of interesting information concerning the teaching and research staff of the Ceramics Department at the University, information and pictures of the graduate students of the senior class, an alumni directory, 1926–1937, and information and photographs of the activities of the University of Illinois chapter of the Student Branch of the Society.

The students are to be commended on their publication.

PENNSYLVANIA STATE COLLEGE

The Pennsylvania Student Branch has an active membership of twenty-three undergraduates and twelve associates, which include five faculty members and seven graduate students. Several are members of the American Ceramic Society. The offices for the present year are held by Donald I. Smith, *President;* Wm. P. Bramlett, *Vice-President;* George J. Morris, *Secretary-Treasurer;* and Nelson W. Taylor, *Advisor.*

Early in the fall Penn State was host for the Glass Division Meeting of the American Ceramic Society which was attended by members of the Student Branch. The present student officers opened their first meeting of the year with a showing of Kodachrome colored slides by N. W. Taylor followed by a cider fest. Later meetings included a talk on "Mining Methods of Ceramic Raw Materials" by W. M. Myers, Associate Professor of Mineral Economics and Technology, and the sound film "Heat and Its Control," a production by Johns-Manville Corporation.

—Donald I. Smith, *President*

RUTGERS CERAMICS CLUB

The Rutgers Ceramics Club and Student Branch of the American Ceramic Society held a meeting in the Ceramics Building, Rutgers University, April 11, 1938. The feature of the meeting was a talk by R. R. Danielson, Metal and Thermit Corp., Carteret, N. J., on the subject "The Opacity of Enamels."

—GLENN N. HOWATT, *President*

OHIO STATE UNIVERSITY

The regular monthly meeting of the Student Branch, Ohio State University, was held Wednesday, April 13, 1938, in Lord Hall.

The speaker for the evening was B. C. Freeman of the Department of Geology. Mr. Freeman spoke on his trip to Labrador and showed some interesting slides in connection with the trip.

—JAMES WILLIS, *Secretary*

OFFICIAL PERSONNEL OF DIVISIONS, 1938–1939

	Art	Enamel	Glass	Materials and Equipment	Refractories	Structural Clay Products	Terra Cotta	White Wares
Trustee	L. E. Barringer	H. G. Wolfram	D. E. Sharp	G. H. Brown	C. E. Bales	J. L. Child	J. L. Carruthers	E. H. Fritz
Chairman	A. E. Baggs	G. H. Spencer-Strong	L. C. Roche	R. B. Carothers	N. W. Taylor	T. W. Garve	H. E. Davis	F. P. Hall
Vice-Chairman			N. W. Taylor	William Malkin	S. F. Walton	E. C. Clemens		
2nd Vice-Chairman			W. R. Lester					
Secretary	C. C. Engle	D. G. Bennett	S. R. Scholes	B. T. Bonnot	J. B. Austin	H. Z. Schofield		K. Schwartzwalder
Nominations	G. H. Stapleford W. A. Weldon	B. T. Sweely H. D. Carter G. H. McIntyre	G. W. Morey James Bailey	J. E. Eagle Tom Falknor	R. E. Birch H. M. Kraner	L. R. Whitaker G. R. Duncombe, Jr.	H. D. Callahan R. L. Clare	J. W. Hepplewhite R. E. Hanna
Editorial	R. G. Cowan E. de F. Curtis H. S. Nash	W. N. Harrison J. J. Canfield H. D. Carter	G. E. F. Lundell B. E. Warren James Bailey	R. R. Robinson G. W. Jarman M. C. Shaw	J. O. Everhart J. D. Sullivan C. M. Dodd	Ellis Lovejoy Howell Fréchette C. R. Austin		L. H. Brown H. F. Royal T. A. Klinefelter
Papers and Program	L. E. Barringer F. H. Rhead H. L. Bacher	W. H. Pfeiffer	N. W. Taylor W. R. Lester	W. H. Emerson B. M. Burchfiel S. S. Cole F. E. Finch	Gilbert Soler	E. W. Knapp	H. E. Davis D. F. Albery	Harry Thiemecke Ralston Russell W. W. Meyer
Membership	P. E. Cox C. C. Engle	W. V. Knowles	J. T. Ogden	C. H. Peddrick, Jr. J. E. Wiss E. L. Maxson L. N. Gill	R. S. Bradley	H. L. Longenecker		Donald Hagar
Standards	K. E. Smith	C. R. Amberg	G. W. Morey	F. S. Bell	S. M. Swain E. H. Van Schoick	H. L. Longenecker		R. M. Campbell
Research	F. H. Norton	W. N. Harrison		R. C. Meeker O. C. Ralston	G. R. Pole	H. R. Straight		S. J. McDowell
Education	M. L. Fosdick Glen Lukens			A. A. Wells	H. E. White	J. L. Carruthers	E. E. Marbaker	F. H. Norton
Data	T. E. Ryder	J. E. Rosenberg		F. A. Guignon		H. G. Schurecht	E. E. Marbaker	Edward Schramm
Rules	C. M. Harder	R. D. Landrum	A. N. Finn	J. E. Eagle H. B. DuBois	K. E. Buck	G. H. Duncombe, Jr.		R. F. Sherwood
Councillors	Frederick Carder	F. R. Porter B. J. Sweo	F. C. Flint					R. F. Geller
Exhibitions	R. G. Cowan							L. E. Thiess
Industrial Management	Theodore Lenchner							F. H. Riddle

SCHOOL NOTES

FIFTH CONFERENCE ON GLASS PROBLEMS

The Fifth Conference on Glass Problems will be held at the University of Illinois, May 20 and 21, 1938. C. W. Parmelee of the Department of Ceramic Engineering, University of Illinois, will act as Chairman of the program on "Glass Batch Problems." G. G. Hanson, Colorado Feldspar Co., Chicago, Ill., will act as Chairman of the session on "Glass-Forming Molds." The meetings will be held at the Ceramics Buildings, University of Illinois, Urbana, Ill.

Discussion of Glass Batch Problems

Friday, May 20 1:30 P.M.

Address of Welcome by Dean M. L. ENGER.

(1) "Batch Handling," by A. D. SCHILLER, Corning Glass Works, Corning, N. Y.

(2) "Batch Mixing and Handling," by E. E. MILNER AND E. E. MILNER, JR., Ball Bros. Co., Muncie, Ind.

(3) "Feeding Batch to Tank Furnaces," by V. C. FUGMAN AND H. I. VORMELKER, General Electric Co., Cleveland, Ohio.

(4) "Batch Weighing Trends." by A. J. JEROME, Toledo Scale Co., Toledo, Ohio.

(5) "Briquetting of Glass Batch," by F. G. SCHWALBE, Toledo Engineering Co., Inc., Toledo, Ohio.

(6) "Batch Preparation and Handling in the Streator Factory, Owens-Illinois Glass Company," by J. W. WRIGHT, Owens-Illinois Glass Co., Alton, Ill.

7:30 P.M.

(7) "Electric Melting of Glass," by Y. R. CORNELIUS, Englewood, N. J.

(8) "Natural Laws Hurdle National Boundaries," by Z. C. KLINE, General Electric Co., Cleveland, Ohio.

Discussion of Glass-Forming Molds

Saturday, May 21 9:30 A.M.

(9) "Fabrication of Glassware: Mold Faults and Remedies," by G. B. LANGER, Lynch Corp., Anderson, Ind.

(10) "Developments in Mold Irons," by J. S. VANICK, International Nickel Co., Inc., New York, N. Y.

(11) "High Test Irons," by F. W. DIXON, JR., Gunite Foundries Corp., Rockford, Ill.

(12) "Concerning Colloidal Graphite and Its Utility in the Glass Industry," by R. SZYMANOWITZ, Acheson Colloids Corp., New York, N. Y.

SUMMER COURSES IN PRACTICAL POTTERY, WEST VIRGINIA UNIVERSITY

West Virginia University has announced three special summer courses, as follows: Practical Pottery 110s is designed to acquaint the student with the fundamentals of clayworking. The laboratory work includes the preparation of pottery bodies, shaping of ware, firing, glazing, and decorating. A small part of the time is taken up with lectures and discussion of industrial practices. The class will visit one or more potteries during the term. Offered either term of the Summer Session, June 8 to July 20, or July 21 to August 25.

Practical Pottery 235s is a continuation of 110s, but the two may be taken concurrently. This course treats largely with preparation and application of glazes, various coloring material used in ceramics, decorative materials available, and glaze calculations. Offered during the first term of the Summer Session, June 8 to July 20.

Pottery and Ceramic Art 236s gives extended drill in the methods learned in the other two courses but may be taken concurrently with either. This drill is followed by forming and decorating the more complicated shapes and special glaze and color effects, testing of native clays, and making plaster molds for casting clayware. There will be lectures and library assignments in addition to work in the clay shop. Offered during the second term of the Summer Session, July 21 to August 25.

Thomas Parker will be instructor in the clay shop. Lectures, library assignments, and preparation of glazes and colors will be under the direction of W. A. Koehler.

Requests for information regarding any of these courses should be addressed to W. A. Koehler, Mechanical Hall, Morgantown, W. Va.

SUMMER COURSE IN "THEORETICAL AND APPLIED COLLOID CHEMISTRY AND COLLOID PHYSICS"

The Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, Mass., has announced the third special summer program in "Theoretical and Applied Colloid Chemistry and Colloid Physics." The course will be conducted under the direction of E. A. Hauser, Department of Chemical Engineering, and will extend over a period of five weeks beginning June 13, 1938.

The program will consist of lectures, round-table discussions, and laboratory investigations and is offered to men actively engaged in industry or research.

Guest speakers from various industries as well as known experts in the field of colloid chemistry and physics will address the group during the course. Wolfgang Ostwald, one of the foremost pioneers in colloid chemistry, and possibly other European authorities will give special lectures during their visit to the United States to attend the Fifteenth National Colloid Symposium.

The program will rate as seventeen credit hours for those interested in obtaining credit toward an advanced degree.

Inasmuch as the Fifteenth National Colloid Symposium will be held at the Massachusetts Institute of Technology from June 9 to 11, all those who intend to register for the course in colloid chemistry are cordially invited to avail themselves of this opportunity and so arrange their arrival in Cambridge to permit them to be present at the Symposium.

Detailed information may be obtained by writing to Dr. E. A. Hauser, Massachusetts Institute of Technology, Cambridge, Mass.

NOTES AND NEWS

HONORARY DEGREE FOR J. EARL FRAZIER

J. Earl Frazier, vice-president of Frazier-Simplex, Inc., Washington, Pa., and specializing in engineering in the glass industry, has received announcement that the honorary degree of Doctor of Chemistry has been conferred on him by the Academia de Sciencias e Artes, an Industrial Institute of Technology of Rio de Janeiro, Brazil. Mr. Frazier also received the Scientific Gold Medal of Merit from the Institute in recognition of services he has rendered Pan-American countries in connection with glass engineering.

J. Earl Frazier

Mr. Frazier received his collegiate preparatory work at Washington high school, his classical education at Washington & Jefferson College, and his engineering training at the Massachusetts Institute of Technology.

His practical glass manufacturing and design experience began in 1924 through 1926, when he was employed as a technical chemist for the Berney-Bond Glass Co., now a division of the Owens-Illinois Glass Co.

Since 1926, Mr. Frazier has been in the employ of Frazier-Simplex, Inc., formerly Simplex Engineering Co. He has held various positions as an engineer and officer. He is also vice-president of the Washington-Union Trust Co. of Washington, Pa.

Mr. Frazier is designated as a Fellow in the Royal Society of Arts and maintains membership in the American Ceramic Society, the National Society of Professional Engineers, the American Chemical Society, the English Society of Glass Technology, and the American Society of Heating & Ventilating Engineers. His name appears in America's Young Men.

DR. GILLETT, 1939 HOWE MEMORIAL LECTURER

H. W. Gillett, Chief Technical Adviser, Battelle Memorial Institute, Columbus, Ohio, has been chosen to deliver the 1939 Howe Memorial Lecture of the American Institute of Mining and Metallurgical Engineers. The Howe Lecture, established in 1923 in memory of Henry Marion Howe, Past-President of the A.I.M.M.E., is given each year by someone of recognized, outstanding achievement in iron and steel metallurgy or metallography. The choice is made by the Board of Directors upon recommendation of the Iron and Steel Division.

HARRIETT ROBERTS HOWELL EXHIBITED AT TOLEDO MUSEUM OF ART

In the exhibit of contemporary decorative art held at the Toledo Museum in February, 1938, the names of exhibitors were listed who are members of the American Ceramic Society. Among these, the name of Harriett Roberts Howell was inadvertently omitted. Miss Howell has her studio in Cleveland, Ohio, with kiln and equipment for ceramic ware production and has been actively engaged in teaching as well as producing ceramic artware.

FELLOWSHIP AWARDS FROM LALOR FOUNDATION

The Board of Trustees of the Lalor Foundation, Wilmington, Delaware, has announced the selection of winners of five awards from the Lalor Foundation for research in chemistry for the academic year 1938–1939. These awards comprise three fellowship grants of $2500 each and two supplemental awards of $1250 each. The recipients were chosen from a group of thirty-eight candidates.

The recipients of the awards and the work in which they will be engaged are as follows:

Leland J. Haworth, University of Wisconsin, will continue his work with F. G. Keyes in the Research Laboratory of Physical Chemistry at the Massachusetts Institute of Technology on the fundamental properties of materials at low temperatures.

R. S. Livingston, Associate Professor at the University of Minnesota, is to spend a sabbatical year working with Professor Frank at Johns Hopkins University on the study of photosensitized chemical oxidations.

Lucy Pickett, Assistant Professor at Mount Holyoke College, will carry on studies of absorption spectra of pure hydrocarbons with Professor Henri at the University of Liège in Belgium and for work at Harvard University. Dr. Pickett has also been honored by a grant of a fellow-

ship from the funds of the Committee for the Relief of Belgium.

Walter W. Pigman, University of Maryland, will have a year's leave of absence from his position in the Bureau of Standards in Washington to work with Professor Helferich of Leipzig, Germany, on the chemical nature and constitution of enzymes.

John W. Stout, University of California, will continue his researches with Professor Giauque on the thermal and magnetic properties of various substances at the lowest temperatures available by adiabatic magnetic cooling.

—C. L. BURDICK, *Secretary*

DELEGATES APPOINTED TO THE INTERNATIONAL CHEMISTRY CONGRESS

Upon the invitation of the Italian Government, the United States, through the State Department, has appointed delegates to the Tenth International Congress of Chemistry to be held in Rome, May 14 to 21, 1938. C. C. Concannon, chief of the Chemical Division, Bureau of Foreign and Domestic Commerce, Department of Commerce, has been named chairman. The other delegates are Edward Bartow, Norman Bekkedahl, M. T. Bogert, H. A. Gardner, Thomas Midgley, Jr., W. A. Noyes, Sr., C. L. Parsons, Alexander Silverman, W. W. Skinner, J. W. Turrentine, and E. R. Weidlein.

INDUSTRIAL RESEARCH LABORATORIES

Revision of Bulletin 91, National Research Council

The increase in the number of research laboratories maintained by industrial concerns in the United States during the last few years has made it seem desirable to issue a new edition (the fifth) of the National Research Council's Bulletin, "Industrial Research Laboratories of the United States."

Questionnaires were mailed on March 25 to the 1562 companies which were included in the last edition of 1933 and to a large number of new concerns which are thought to maintain laboratories.

If the reader of this note is a member of a firm which maintains a laboratory where research looking toward the development and improvement of products is carried on, it is hoped that he will ascertain whether a questionnaire has been received by his company, and if not, that he will request one from the Library, National Research Council, 2101 Constitution Avenue, Washington, D. C.

There is no charge for the entry in *The Bulletin*, the only requirement being that the laboratory is undertaking research.

It is desirable to have the information for *The Bulletin* in hand as soon as possible so that the publication may appear within the current year.

PORCELAIN ENAMEL INSTITUTE MEETINGS

Third Annual Institute Forum

The Third Annual Porcelain Enamel Institute Forum will be held at the University of Illinois in Urbana, Ill., October 12 to 14, 1938.

Eighth Annual Institute Meeting

The Eighth Annual Meeting of the Porcelain Enamel Institute will be held in Cleveland, October 25 and 26.

Proceedings of Second Institute Forum

Proceedings of the Second Forum of the Porcelain Enamel Institute held at the Ohio State University, Columbus, Ohio, October 13 to 15, 1937, have been sent to all persons in attendance at the Forum and to all members of the Institute. Copies of the Proceedings of the Second Forum are being offered at $2.00 each. The Institute also has a limited quantity of the Proceedings of the First Forum and will include a copy with their compliments with the purchase of each copy of the Second Forum Proceedings, in order to make a complete set. Orders should be sent to the Porcelain Enamel Institute, Inc., 612 North Michigan Ave., Chicago, Ill.

EASTERN ENAMELER'S CLUB

The spring meeting of the Eastern Enameler's Club will be held on Saturday afternoon, May 21, at 3:30 P.M., at the Lord Baltimore Hotel, Baltimore, Md. The following program has been arranged:

(1) "Architectural Enamel: Its Qualities and Its Future," by R. M. KING, Ohio State University, Columbus, Ohio.

(2) "Tooling of Enameling Furnaces," by LYMAN ATHY, Porcelain Enamel & Mfg. Co., Baltimore, Md.

(3) "Experiences with Some Shop Troubles in Porcelain Enameling," by FRED SUTPHEN, American Rolling Mill Co., Middletown, Ohio.

(4) General Discussion of Various Enameling Operations, led by H. F. PARKER, Wheeler Reflector Co., Burrage, Mass.

Following the program, a dinner will be served at the Lord Baltimore Hotel. A cordial invitation is extended to anyone interested in enameling to attend this meeting. The program will deal with matters of practical interest to enamelers, and there will be an evening of entertainment and good fellowship.

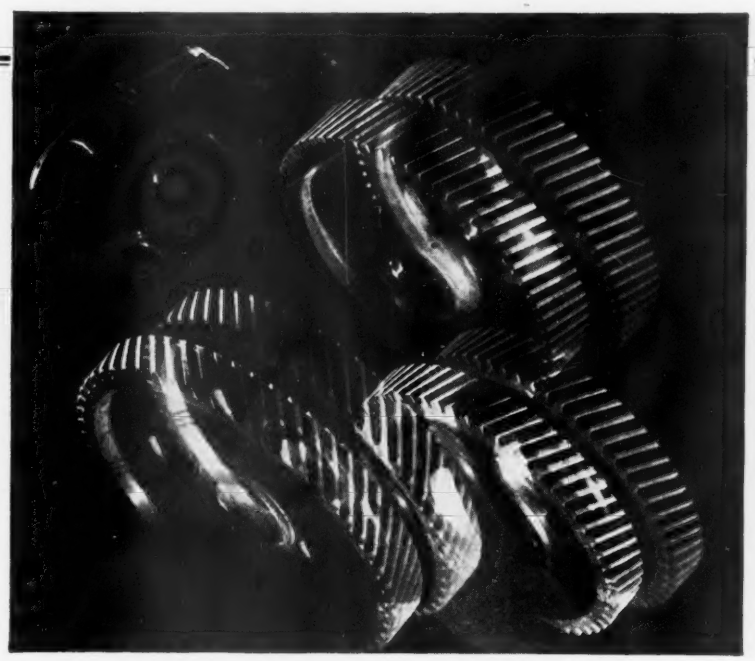
—R. R. DANIELSON

SIMPLIFIED PRACTICE RECOMMENDATION R61-30, CLAY TILE FOR FLOORS AND WALLS

Simplified Practice Recommendation R61-30, Clay Tile for Floors and Walls, has been reaffirmed again by the Standing Committee of the industry, according to an announcement of the Division of Simplified Practice of the National Bureau of Standards.

This Recommendation was first promulgated in 1927 under the title, "White Glazed Tile and Unglazed Ceramic Mosaic." It was revised in 1930, and reaffirmed in 1935, under the present title. The program concerns simplification of dimensions, grade nomenclature, methods of grade marking, and grade certification.

Copies of the Recommendation may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for ten cents each.



Winning and Holding the Spotlight Requires Just Three Things . . . . .

1 ACCENT ON ENGINEERING

2 OUSTANDING QUALITY

3 SERVICE

ENGINEERING design is the link between science and art. • **QUALITY** is the appearance, color, and texture that distinguishes one manufacturer's product from another. • **SERVICE** is the continuous uninterrupted operation of equipment and the maintenance of same. • **THE SIMPLEX ORGANIZATION** with its ultra modern furnaces, tanks, lehrs, and plants for manufacturing glass, has been built up and has progressed by its *Engineering, Quality, and Service,* and we invite the most critical to try our designs.

FRAZIER-SIMPLEX, INC.

WASHINGTON TRUST BUILDING • WASHINGTON, PENNSYLVANIA

"CERAMIC" COLORS *For Satisfaction in Production*

COLORS

For Enamels:—Colors and Oxides; Smelter Oxides; Graining, Printing, Banding, and Screening Colors.

For Pottery:—Glaze and Body Stains; Underglaze and Overglaze Colors for Banding, Spraying, and Screening; Fritted Glazes and Fluxes.

For Glass:—Enamels; Vitrifiable Colors for Banding, Spraying, and Screening; Printing Colors; Fluxes; Batch Colors.

Decorating Supplies:—Printing Tissue; Screening Oils, French Fat Oil, Oil of Copaiba, Balsam Fir, Damar Varnish; Brushes; Knives and Spatulas; Grinding Mills.

CHEMICALS

Aluminum Hydrate
Ammonium Carbonate
Antimony Oxide
Antimony, Black Needle
Barium Carbonate
Barium Chromate
Bone Ash
Cadmium Carbonate
Cadmium Oxide
Cadmium Sulphide
Calcspar
Chrome Oxide, Green
Clay, Vallendar
Cobalt Oxide, Black
Cobalt Sulphate
Copper Oxides
Iron Chromate
Iron Oxides
Kryolith
Lead Chromate
Magnesium Carbonate
Manganese Dioxide
Nickel Oxide, Black
Nickel Oxide, Gray
Nickel Sulphate
Potassium Bichromate
Potassium Nitrate
Potassium Permanganate
Powder Blue
Rutile, Powdered
Selenium
Sodium Aluminate
Sodium Antimonate
Sodium Bichromate
Sodium Silicate
Sodium Silico Fluoride
Sodium Uranate
Tin Oxide
Titanium Oxide
Uranium Oxide, Orange
Uranium Oxide, Yellow
Zirconium Oxide

"CERAMIC" COLORS

CERAMIC COLOR & CHEMICAL MFG. CO., NEW BRIGHTON, PENNA.

ORTON STANDARD PYROMETRIC CONES

For Forty-Two Years
The American Standard for
Control of Ceramic Heat Treatment

THE EDWARD ORTON, JR.,
CERAMIC FOUNDATION
George A. Bole, D.Sc., *Manager*

Laboratories & Office
1445 Summit Street—Columbus, Ohio

THE VITRO MFG. CO. TRADE MARK PITTSBURG, PA.

Discriminating users of ceramic colors will ally themselves with a progressive source of supply.

Vitro offers the advantages of intelligently directed research and a highly efficient organization.

VITRO

CORLISS STATION — PITTSBURGH, PA.

16 California St. San Francisco, Cal.

Eskimos once weighted their fish nets with stones of

Kryolith

THE NATURAL GREENLAND CRYOLITE

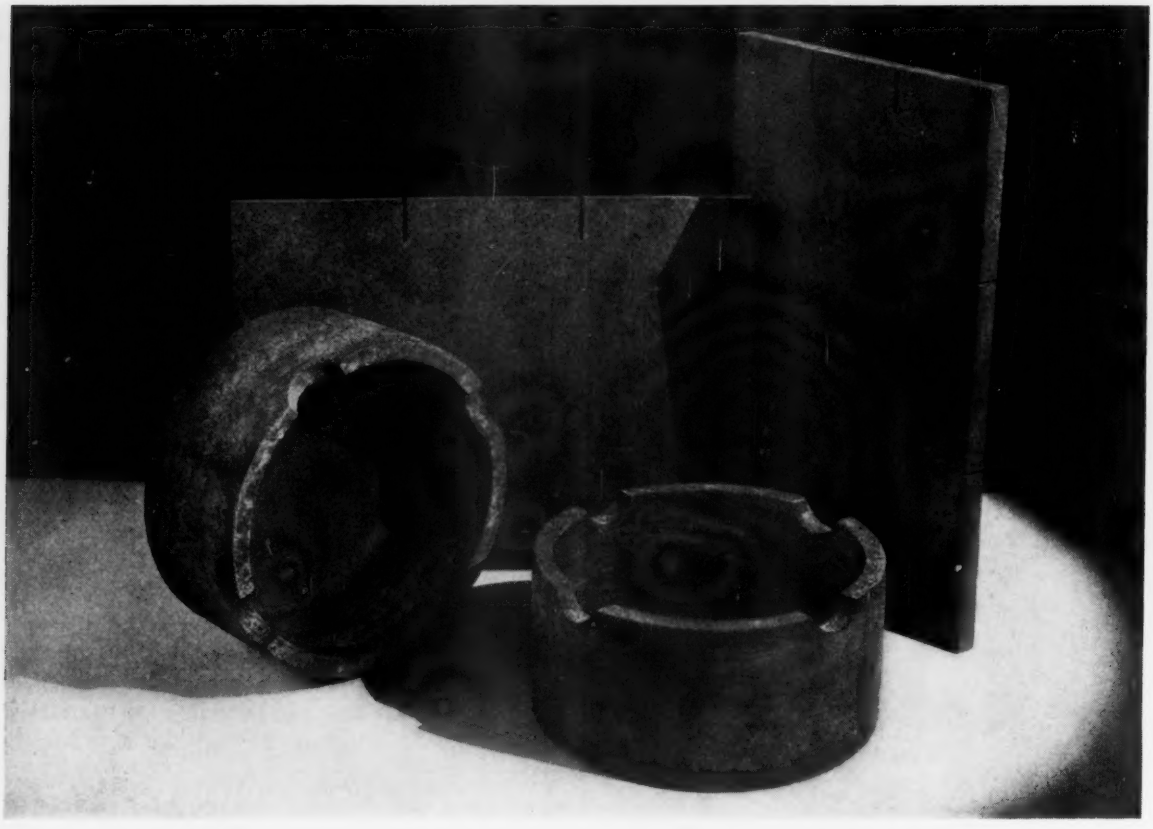
WHAT is known today to the makers of fine glass and enamel ware as "Kryolith" once served the humble purpose of adding weight to fish nets. Pieces of the mineral were used as sinkers by the Eskimo fishermen of Greenland.

That was a century ago. Kryolith now serves the ceramic industry as the fluoride flux and opacifier which has made possible many of our finer modern products. It still comes from Ivigtut in Greenland, which has the only known commercial deposit in the world.

The elements in the genuine natural Greenland cryolite are combined by Nature as a stable double fluoride, without the presence of combined moisture. That is the basis for most of its unique advantages. It will pay you to be sure that the frit you buy is made with the natural material—Kryolith.

PENNSYLVANIA SALT MANUFACTURING COMPANY · Est. 1850
Widener Bldg., Philadelphia, Pa.
New York · Chicago · St. Louis · Pittsburgh · Tacoma · Wyandotte

PENNSYLVANIA SALT *Chemicals*



RAPID TEMPERATURE CHANGE
AND UNEQUAL HEATING . . .

Both are Defied by
CRYSTOLON BATTS and SAGGERS

EXCLUSIVE to Norton is the slotted batt—a patented form of construction. Combined with the high heat conductivity, unusual strength and resistance to thermal shock of Norton-made silicon carbide, it gives to Crystolon Batts the ability to withstand most successfully the two chief worries of kiln operators—rapid temperature change and unequal heating.

Because Crystolon Batts, Saggers and Supports are cutting kiln furniture costs they are coming into wider use in progressive ceramic plants.

NORTON COMPANY
Worcester, Mass.
New York, Chicago, Cleveland

NORTON
REFRACTORIES

EDGAR CLAYS

Considerable data regarding grain size distribution in various clays was brought out at the American Ceramic Society Meeting held in New Orleans recently.

We have produced fractionated clays for many years.

Unusual results may be attained by combining fractionated clays to give proper grain size distribution in Pottery Bodies.

Samples of coarse and fine fractionated clays furnished on request.

EDGAR PLASTIC KAOLIN CO. EDGAR BROTHERS CO.

Home Office—Metuchen, N. J. New York Office—50 Church St.

Mines in Georgia and Florida

HARTFORD-EMPIRE COMPANY

HARTFORD, CONN.

Engineers and Licensors

FEEDERS FORMING MACHINES CONVEYORS

STACKERS LEHRS

PYRO THE SIMPLIFIED OPTICAL PYROMETER

THE ONLY SELF-CONTAINED, DIRECT READING, RUGGED AND FOOL-PROOF INSTRUMENT FOR GLASS AND CERAMIC PLANTS, LABORATORIES, ETC.

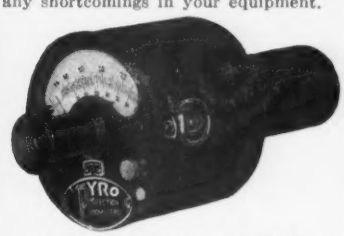
Unique construction enables operator to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts to consult, no accessories, no upkeep.

New concentrated test mark and ease of operation permit unusually close and rapid temperature determinations. PYRO is standard equipment with the leading plants in your industry.

Stock Ranges 1400° to 5500° F.

PYRO RADIATION PYROMETER

The ideal instrument for Furnace or Kiln use. Gives actual heat of material aside from furnace or kiln temperature. Does not require a skilled operator—strictly automatic. Eliminates personal errors. Always ready to tell within three seconds any shortcomings in your equipment.



Stock Ranges 1000° to 3600° F.
Write for special bulletins.

105–109 Lafayette Street

THE PYROMETER INSTRUMENT CO.
NEW YORK, N. Y.

THE MARK OF QUALITY

THE WORLD'S PEMCO FINEST

THE PORCELAIN ENAMEL & MFG. CO.
PEMCO and EASTERN AVES., BALTIMORE, MD.

Tunnel, Truck and Humidity Dryers for—

Dry Pressed Electrical Porcelain
High Voltage Electrical Porcelain
Sanitary Porcelain
Floor and Wall Tile
Abrasive Wheels
Glass Pots and Blocks
Refractory Brick and Shape
Also Stove Rooms and Mangles for General Dinnerware

PROCTOR & SCHWARTZ, INC.
The Largest Builders of Drying Machinery for Industry
Seventh Street & Tabor Road, Philadelphia, Pa.

BETHLEHEM PRODUCTS
for the Ceramic Industry

88-80 CASTINGS
to save maintenance on grinding equipment

BETHLEHEM ABRASIVE-RESISTING PLATES
for chutes, hoppers, dump-car bottoms

BETHLEHEM TOOL STEEL
for dry press and repress liners

WIRE ROPE
for all excavating and material-handling equipment

Also—Light Rails, Steel Ties and Track Equipment;

BETHLEHEM STEEL COMPANY
General Offices BETHLEHEM STEEL **Bethlehem, Pa.**

District Offices: Albany, Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Detroit, Honolulu, Houston, Indianapolis, Johnstown, Pa., Kansas City, Los Angeles, Milwaukee, Nashville, New Haven, New York, Philadelphia, Pittsburgh, Portland, Ore., Salt Lake City, San Antonio, San Francisco, St. Louis, St. Paul, Seattle, Syracuse, Toledo, Tulsa, Washington, Wilkes-Barre, York.
Export Distributor: Bethlehem Steel Export Corporation, New York

THE SHARP-SCHURTZ COMPANY

CHEMISTS FOR THE CERAMIC INDUSTRY

WE HAVE FULLY EQUIPPED LABORATORIES AT

LANCASTER, OHIO U. S. A.

EMERSON P. POSTE

CONSULTING CHEMICAL ENGINEER

ANALYSES: CERAMIC RAW MATERIALS AND PRODUCTS, FUELS, IRON AND STEEL, ETC

SPECIAL INVESTIGATIONS: PHYSICAL AND CHEMICAL TESTS ON ENAMEL, ETC.

309 McCALLIE AVE.,
CHATTANOOGA, TENN.

BACK NUMBERS
OF
JOURNAL OF AMERICAN CERAMIC SOCIETY
AND ALL IMPORTANT MAGAZINES FROM THE WORLD OVER

We furnish single copies, volumes and sets or photostat reproductions of specific sections, reasonably and promptly

WRITE, PHONE OR WIRE PERIODICALS DEPARTMENT

THE H. W. WILSON COMPANY 950 University Avenue, New York

WILLSON BAG RESPIRATORS

Nos. 300 and 400 (Patent applied for) have
UNITED STATES BUREAU OF MINES APPROVALS
A Willson style for every dusty operation in the Ceramic Industry.
WILLSON PRODUCTS, Inc. **Reading, Pa.**

McDANEL REFRACTORY PORCELAIN COMPANY
Manufacturers of
PORCELAIN TUBES PROTECTION TUBES
INSULATING TUBING and BEADS
BEAVER FALLS PENNSYLVANIA

THREE ELEPHANT
BORAX
REG. U.S. PAT. OFF. REG. U.S. PAT. OFF.
AND BORIC ACID
GUARANTEED OVER 99.5% PURE
AMERICAN POTASH & CHEMICAL CORPORATION
70 Pine Street, New York

FLINT

PAPER MAKERS IMPORTING CO. INC. EASTON, PENNSYLVANIA, U.S.A.

FINEST POTTERY CLAYS

TALC WHITING

THE HOUSE OF HOMMEL
SUPPLIERS OF ALL CERAMIC NEEDS

Quality
FRITS
COLORS
CHEMICALS
Stocked for
IMMEDIATE SHIPMENT

THE
O. HOMMEL CO.
Quality First - Since 1891
209 Fourth Avenue Pittsburgh, Pa.
LET OTHERS IMITATE :- WE ORIGINATE

Pacific Coast Agents
L. H. BUTCHER CO.
Los Angeles - Salt Lake City - San Francisco - Portland - Seattle

SOLVAY
TRADE MARK REG. U. S. PAT. OFF.
dustless dense
SODA ASH

Made Especially for the Glass Maker

Specify SOLVAY when you buy Soda Ash because Solvay is and has been the standard of quality since 1881. It offers the following advantages:

1. More than 99.50% Sodium Carbonate (dry basis).
2. Proper granulation and absolute uniformity in quality.
3. Your choice of Soda Ash graded for efficient use with any of the known commercial glas sands.
4. The services of a well organized technical staff which is available to Solvay customers.

Make Solvay your source of supply for
DUSTLESS CALCINED 98-100%
POTASSIUM CARBONATE
Hydrated 83-85% Potassium Carbonate
Ground Caustic Potash

Full information sent on request.
SOLVAY SALES CORPORATION
Alkalies and Chemical Products Manufactured by The Solvay Process Company
40 RECTOR ST. NEW YORK

Ceramic Service? We Give It

We Manufacture—

Pins—all shapes and lengths
Stilts
Thimbles
Spurs
Saggers
Crucibles
Tile for Decorating Kilns

We Sell—

Ball Clays—Kentucky
Sagger Clays—Kentucky
Ground Fire Clay—Ohio, Pennsylvania
Bitstone—all sizes
Fire Brick
Imported Paris White
Domestic Whiting
Georgia Kaolin
Modeling Clay

THE POTTERS SUPPLY COMPANY
EAST LIVERPOOL, OHIO

CLAYS

English China and Ball

TALCS

for

HEATING ELEMENTS
CERAMIC BODIES
SAGGER USES

Ceramic Specialties Include

Whiting : Paris White : Magnesite
Cornwall Stone : Barium Carbonate
Zinc Oxide : Enameling Clays : Etc.

HAMMILL & GILLESPIE, INC.
Importers since 1848
225 Broadway New York

Lusterlite enamels

Few, if any, frit manufacturers have enjoyed such a high percentage of unsolicited repeat-orders as "Chicago Vit." And nothing evidences so clearly both quality and service as automatic repeat orders. You, too, can depend on LUSTERLITE ENAMELS.

CHICAGO VITREOUS ENAMEL PRODUCT COMPANY
1411 SOUTH 55th COURT
CICERO • ILLINOIS

Ceramic Kilns and Furnaces

Complete Equipment
Designed
Built
Operated

Our broad experience is at your service.

We represent the Ferro Enamel Corporation, Cleveland, Ohio, as sales agents for its complete and successful line of ceramic glazes.

ALLIED ENGINEERING COMPANY

4150 E. 56th STREET CLEVELAND, OHIO

(A SUBSIDIARY OF FERRO ENAMEL CORPORATION, CLEVELAND, O.)

FOR CLAY FILTRATION

use

METAKLOTH

(green)

Silvakloth

(black)

The oldest and best cupra-ammonium finishes for

POTTERY FILTER FABRICS.

These finishes give the fabric a smooth, lustrous, metallic surface—no fibres to catch and break the clay cake as it comes away in one perfect piece—filters better and faster than untreated cloths—requires fewer washings and is easier to keep clean—more continuous operation of your press—lower labor costs and a larger and better product with the same machinery.

The fabric is mildew proofed—pre-shrunk—has an increased tensile strength—has a longer useful life.

This means larger profits for you.

Consult your bag manufacturer or write to,

Metakloth Company. Lodi, N. J.

Forty-First Annual Meeting

AMERICAN CERAMIC SOCIETY

Hotel Stevens, Chicago, Illinois

Week of April 16, 1939

Eight Divisions Meeting Simultaneously

COMING TOGETHER *plus*
KEEPING TOGETHER *plus*
WORKING TOGETHER *makes for*

Progress for Individuals, Industries and States

Thus Civilization Was Started and
Thus It Is Perpetuated

Meetings of this Society make for Advances in Ceramics

WANTED—Used Spencer, Bausch & Lomb, or Leitz petrographic microscope. Give all details as to make and condition. Address Box 167F, American Ceramic Society, 2525 N. High St., Columbus, Ohio

MONTGOMERY PORCELAIN PRODUCTS COMPANY

SPECIALIZING IN

Primary Protection Tubes for all makes of Pyrometers

MONTGOMERY

PYROMETER TUBES

★ CORUNDUM
★ MULLITE
★ REFRACTORY PORCELAIN

MONTGOMERY PORCELAIN PRODUCTS CO.
FRANKLIN OHIO

WANTED

PLANT SUPERINTENDENT must have experience producing small accurately made complicated pieces in large quantities, plain, vitreous and glazed. No risk in answering as this is new proposition. Give entire experience and qualifications in first letter. Address Box 170, American Ceramic Society, 2525 N. High St., Columbus, Ohio.

ACCURATE for control tests

The P. C. E. Furnace

AMERICAN REFRACTORIES INSTITUTE TYPE

Modern refractory practice demands extremely accurate control tests when evaluating clays.

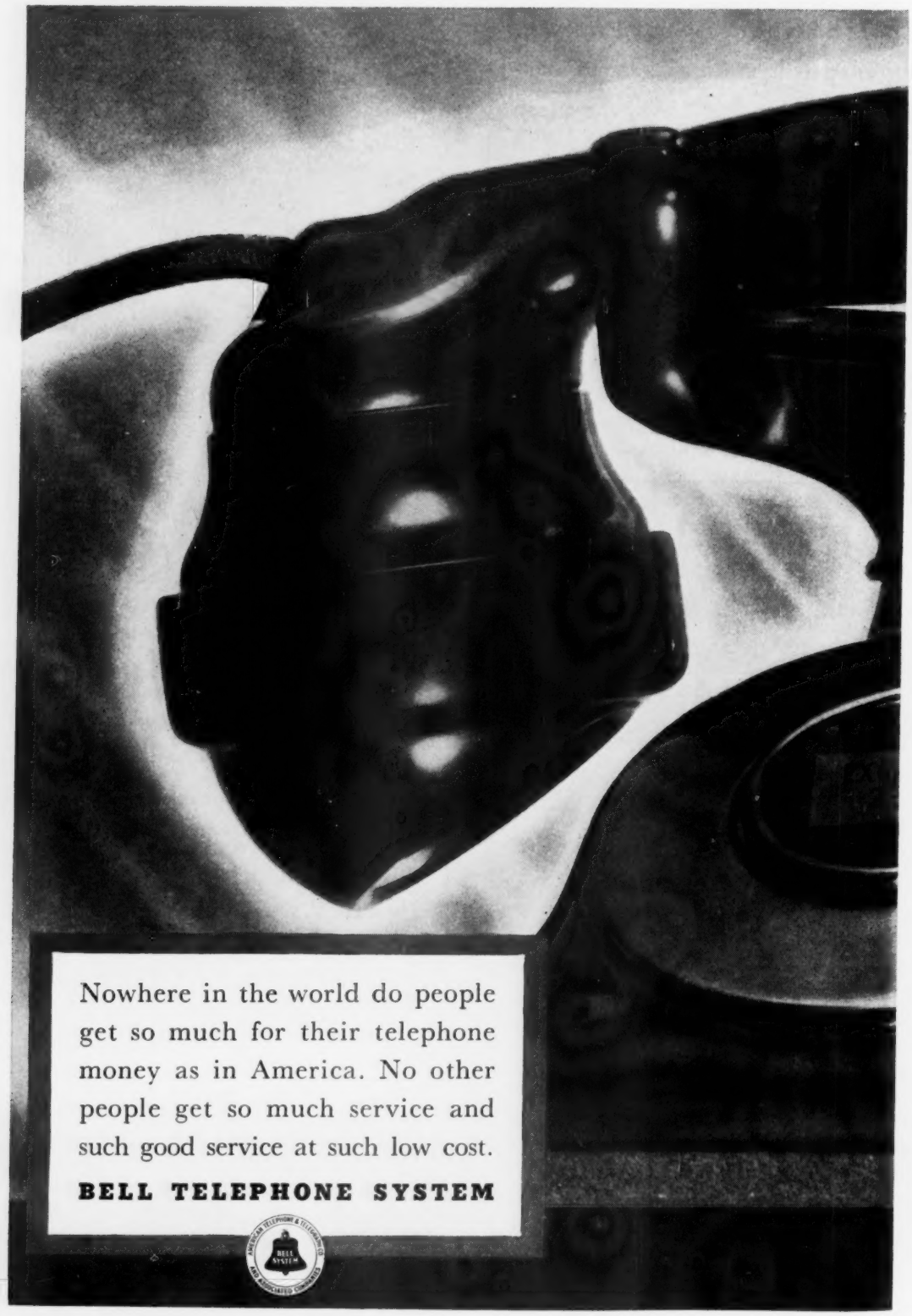
The P. C. E. Furnace was developed for this purpose. It's a portable, efficient furnace capable of reaching high temperature and designed to operate economically on natural or artificial gas, or propane.

Write for Bulletin No. 460

The DENVER FIRE CLAY Company

EL PASO, TEXAS
NEW YORK, N.Y.
DFC
SALT LAKE CITY, UTAH
DENVER, COLO., U.S.A.

THE BIGGEST TELEPHONE VALUE FOR YOUR MONEY



Nowhere in the world do people get so much for their telephone money as in America. No other people get so much service and such good service at such low cost.

BELL TELEPHONE SYSTEM

H. C. SPINKS CLAY COMPANY

Miners and Shippers of

BALL, SAGGER AND WAD CLAY

NEWPORT, KY.

May 7, 1938

Mr. Pete Potter,
Comfortable Sanitary Pottery Mfg. Co.,
Pottsville, Ohio

Dear Pete:

Off to Lousiville this morning to the 64th running of the Kentucky Derby!

My bet? The stage is set for Stagehand. This morning he is the Challenger. This evening he will break with the pack, run a smooth, even race past the stands, around the turn and down the back stretch. As he comes in the "hot zone" you will see him really show his class, work his way out of the pockets. Seventy-five thousand people will stand on their toes and yell! You'll hear the radio announcer's "Here comes Stagehand!" He's tough, he's strong he can stand the heat. He'll be first at the wire. That's where they pay off. The CHAMPION & CHALLENGER.

CHAMPION & CHALLENGER ball clays are running just this kind of race every day around the hot tracks of the circular kilns and down the long stretches of the straight tunnels. Plenty of good competition, but CHAMPION & CHALLENGER ball clay, the SPINKS entry, is winning, paying off every day for our many customers who are betting on them.

They're off!

Dick Carothers

General Manager
H. C. SPINKS CLAY COMPANY

RBC:MLN

11 Tests

Prove the superior quality of

M and T

SODIUM ANTIMONATE

Every lot of M and T sodium antimonate must pass eleven exacting physical, chemical, and enameling tests before it is shipped from the factory.

These tests prove the absolute uniformity of both the product and its performance. They prove that M and T sodium antimonate is entirely free from chemical or physical variations—that it is always of the highest quality which selected raw materials, scientifically processed, can produce.

The many users of M and T sodium antimonate take no chances when they continually choose this superior product.

METAL & THERMIT CORPORATION, 120 BROADWAY, NEW YORK, N. Y.